

WIRED

December 1994

Jon Katz on
natural born killjoy
Oliver Stone

Steven Levy:
The real killer app
is digital cash

Hacker

Showdown

!كن مرتبطاً

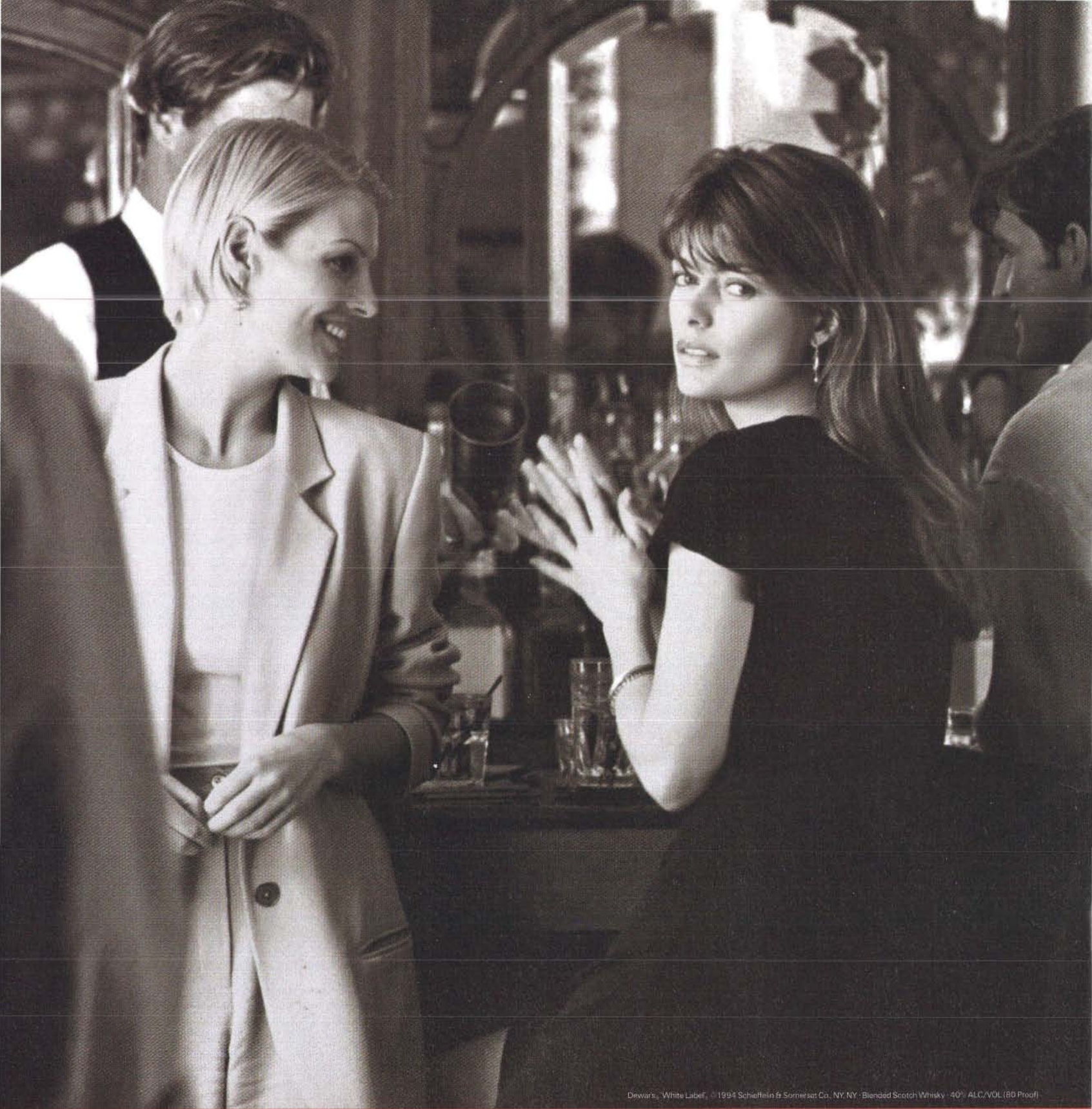
A member of a rival phreaker gang
called John Lee a "nigger" -
and in the hacker underground
nothing was the same again.



Yeah, for some reason
“What’s your major?”
just doesn’t work anymore.



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Introducing Macintosh System 7.5. It can up

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Avoid lines when working on your network. You can print documents simply by using icons on your desktop. To print a file, just drag it onto a printer icon. To change printers, just drop the file onto a different printer icon.



Macintosh PC Exchange.

It's built in, so now you can easily share documents with DOS and Windows users, view the contents of DOS disks as if they came from another Mac, and open and edit files even when you don't have the applications they were created in.



Enhanced desktop.

Faster and easier access to items in your Apple menu. Track and retrieve your most recently used applications, documents and servers more quickly. Create convenient, on-screen notes with new electronic Stickies.™



EMPLOYEE EVALUATION

NAME: Chris Wolfe DATE PREPARED: 9-8-94

TITLE: Product Manager

DEPARTMENT: Account Management

OVERALL PERFORMANCE:

☒ Outstanding ☐ Commendable ☐ Satisfactory ☐ Needs Improvement

COMMENTS:

Chris has become an indispensable member of the account team. He has demonstrated a high level of motivation and enthusiasm for the job. Perhaps the most compelling evidence of this can be found in his ability to work independently, where he picks up new tasks easily with little need for supervision or instruction. He consistently recognizes and works around obstacles to maintain productivity. Consequently, he often completes assignments ahead of schedule. At a time when collaboration is more critical than ever, Chris has also proven to be an excellent team player. He works effectively with coworkers on projects where teamwork is essential, and can easily motivate and inspire others to achieve. When delegating tasks, his thoughts are well organized and his ideas clearly articulated – an indication of his excellent communication skills. His projects are all distinguished by an attention to detail. His conclusions are always sound and logical. And he excels in time management, effectively compiling and analyzing information. He always manages to work efficiently, setting an example for effort throughout the company. Promotion and appropriate compensation are recommended at this time.

Chris Wolfe

Employee's Signature

J. Bloom

Evaluator's Signature

grade your career.

Apple Guide.

Learn by doing. Apple Guide can teach you how to use your Macintosh and new applications by walking you through tasks and procedures step by step. On-screen instructions literally point to and highlight the step being described.



Universal Mailbox.

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You know those tasks you repeat over and over? With AppleScript, you can automate a series of actions you perform frequently and repeat them with a single keystroke. Leaving more room for work—and less room for error.



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Mac OS

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than 50 refinements, enhancements and improvements that will do more than simply change the way your Macintosh personal computer works—they'll change the way you work.

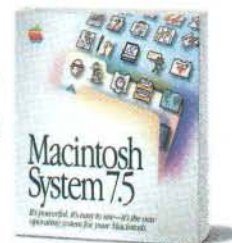
Making you more productive than ever.

For starters, Macintosh System 7.5 enables you to collaborate with others much more effectively.

It speeds up repetitive tasks, makes it possible to send and receive mail from a variety of sources through a single mailbox, lets you swap files with PCs and allows you to open Macintosh, DOS and Windows documents—even when you don't have the applications used to create them.

When it's time to print, you can do so quickly by using simple icons right on your desktop.

You can even teach yourself how to use your Mac™ and new applications with the Apple® Guide, as it literally walks you through procedures, step by step.



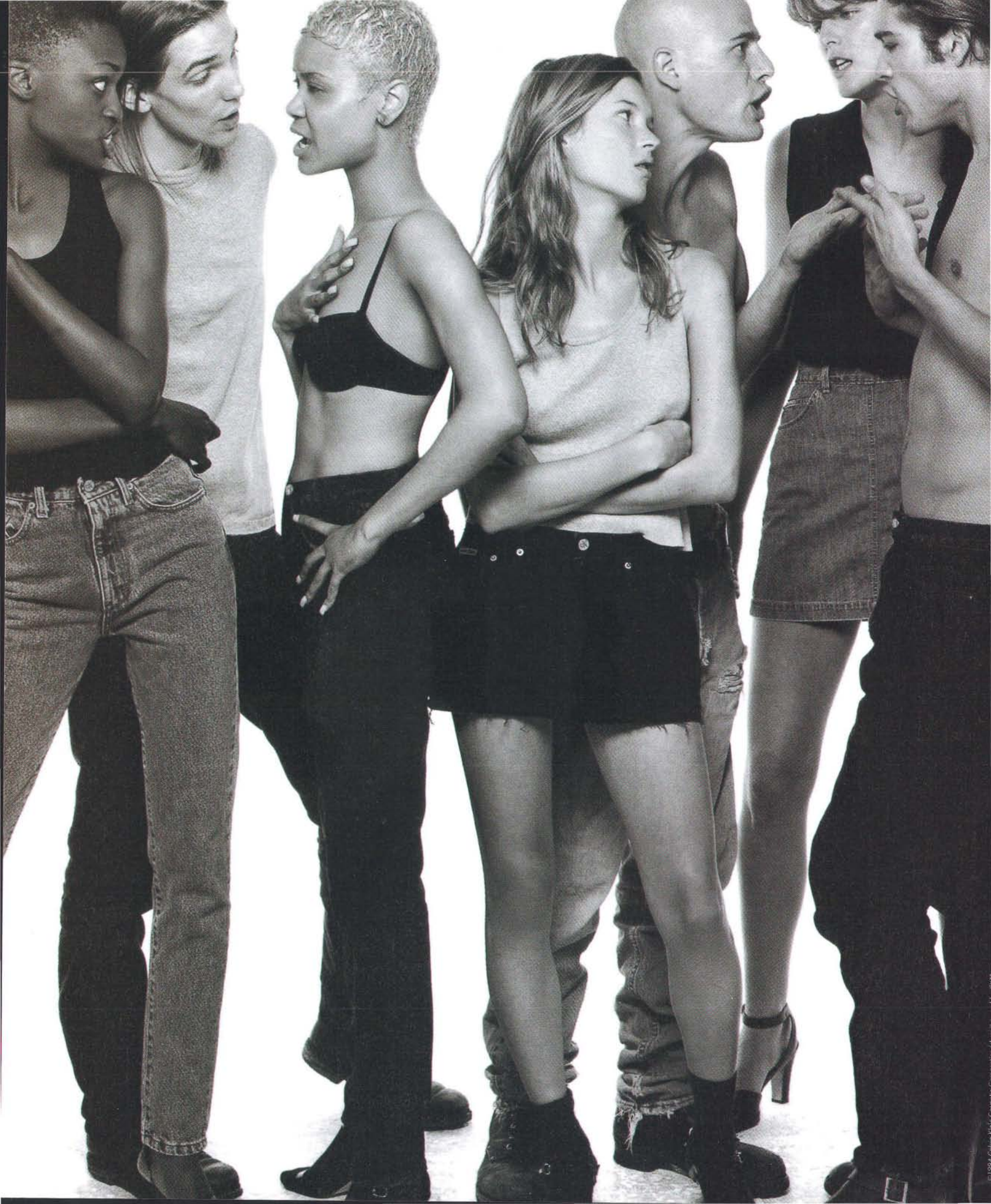
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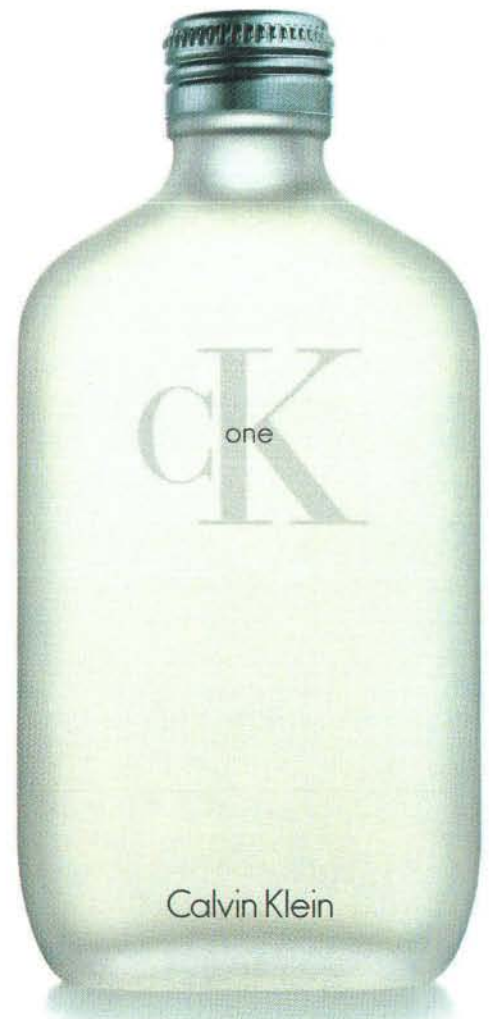
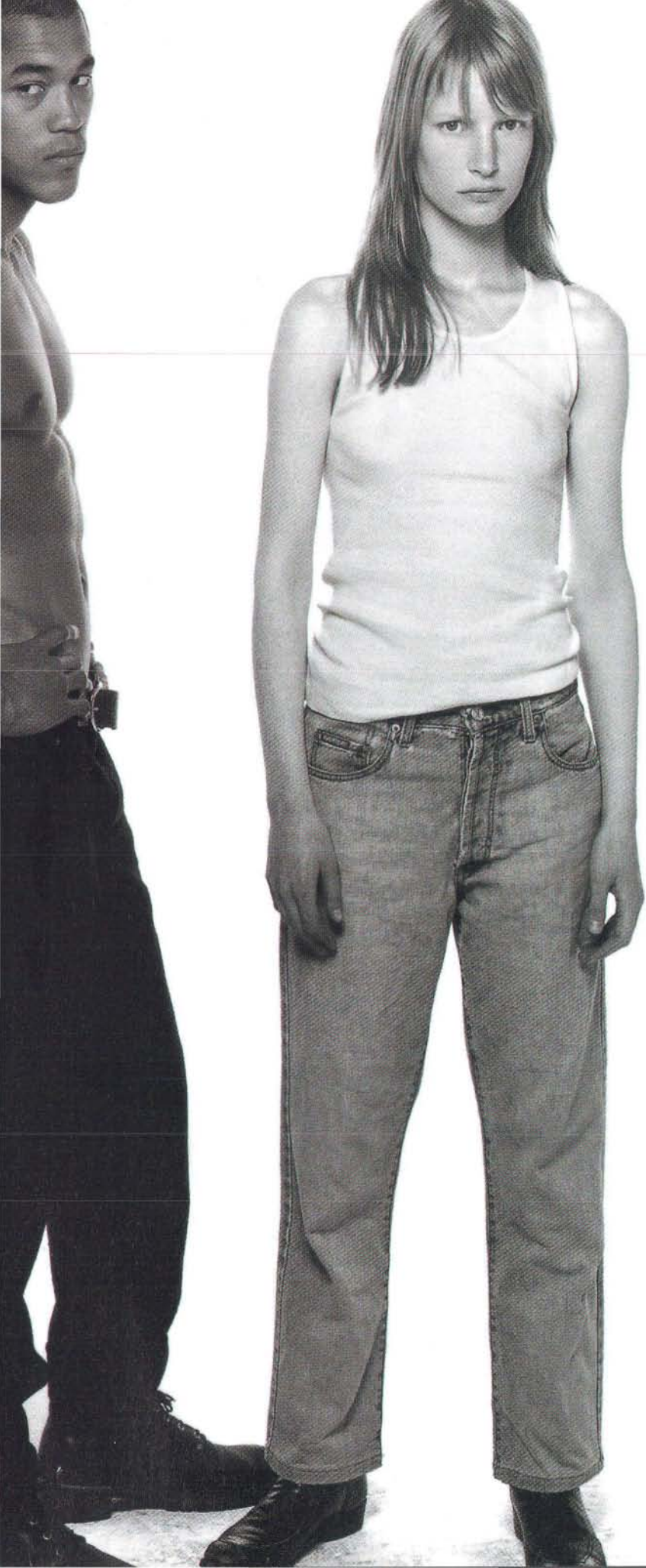
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YOUR AS*S...)) THIS IZ X. ROCKET.))SCI-ENCE...GAME.1...LOAD-STAR...DO(())U READ,)E... THIS I() ROCK

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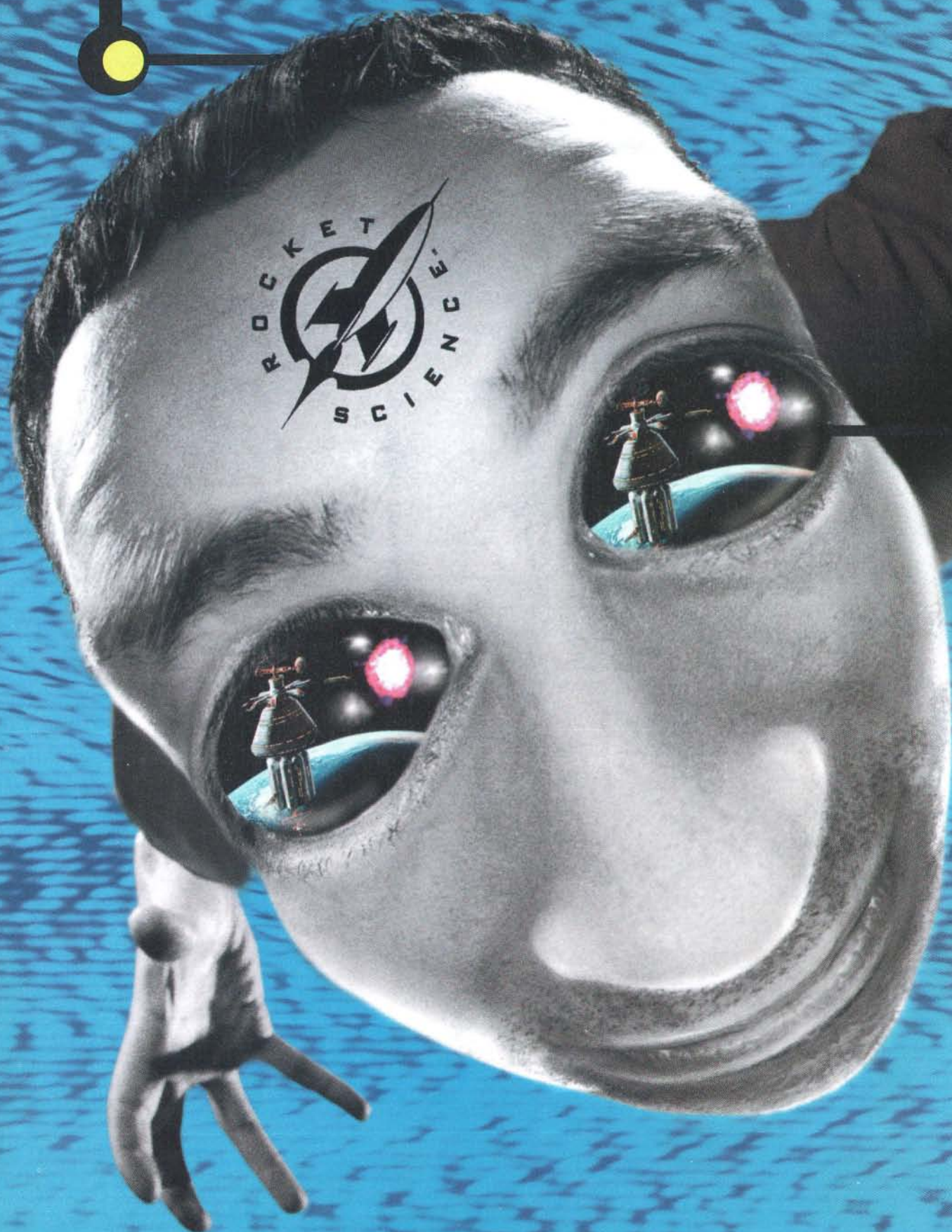
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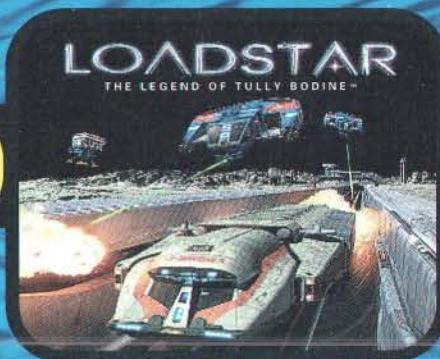


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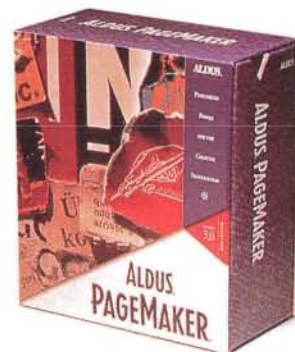
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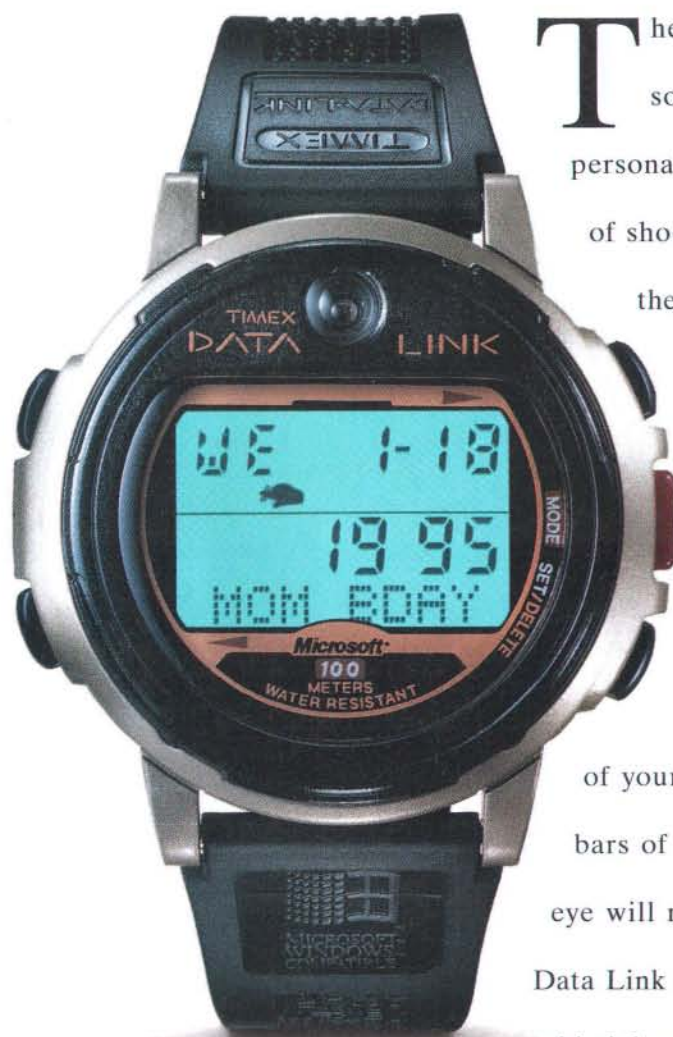
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Presto—all that information is now stored right there inside your watch, as portable as the arm you wear it on. You'll never forget another birthday or anniversary. A week before an important date, a



little hand with a string around the forefinger appears on the watchface (*Get outta here!*—no, really, it does) as a reminder icon. On the actual day itself, the icon flashes



"e kidding me" scores ever recorded.



The Timex Data Link watch can actually read your personal information right from your computer screen.

Link is also a watch. It keeps terrific time, displays the second, minute, hour, day, date, month and year, beeps the hour, has multiple alarms, is water resistant to 100 meters, and comes equipped with the Indiglo® night-light.



If all this seems like a bit



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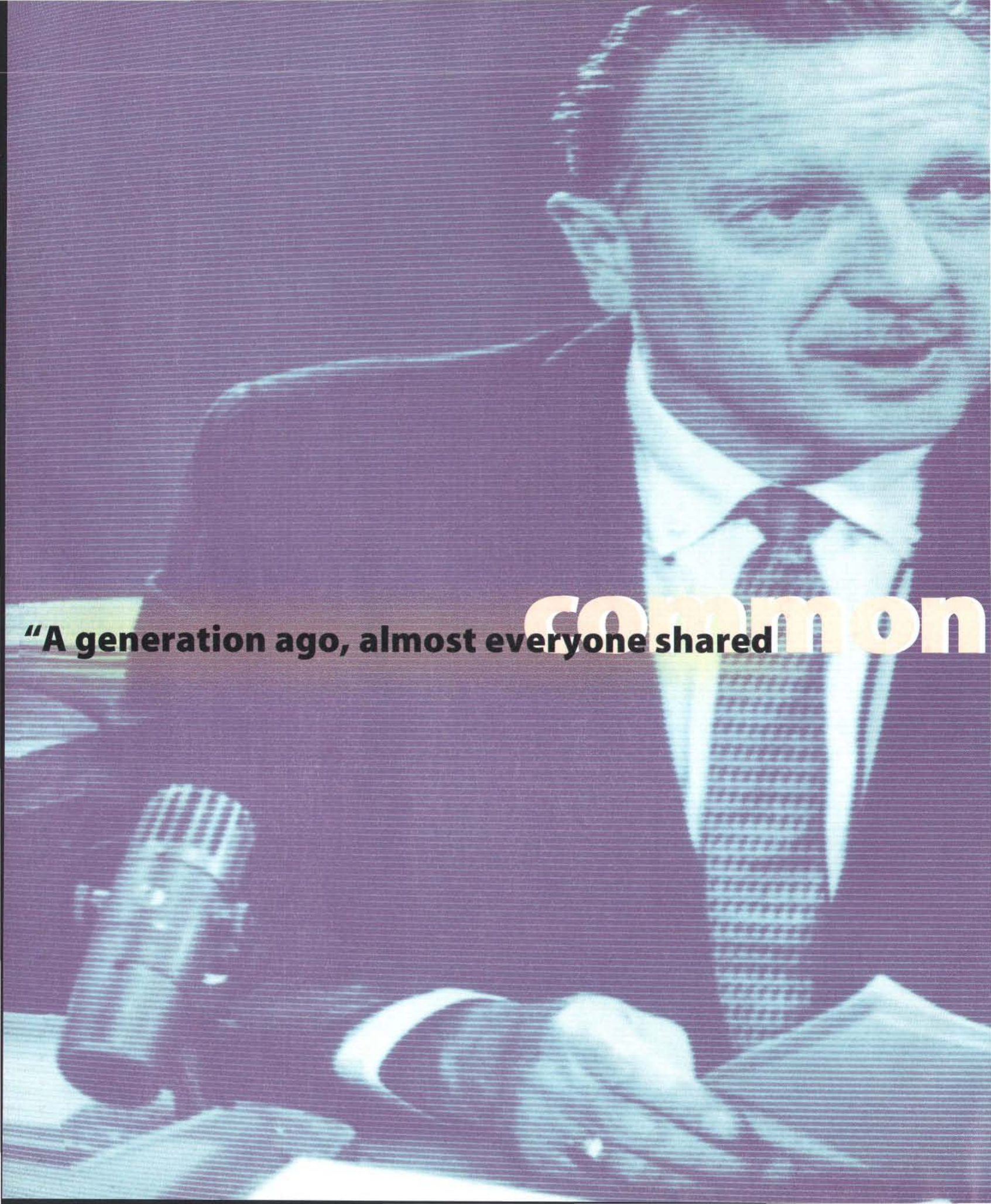
When an appointment is approaching, the watch beeps to tell you to get going, and tells you who you're supposed to meet, and where.

Oh, and lest we forget, the Timex Data



much to believe, we understand. You're encouraged to examine a Timex Data Link watch with your own eyes, or call 1-800-367-8463 for more information. You'll see that everything we've told you is true. Seriously. No lie. Really. Scout's honor. No kidding.

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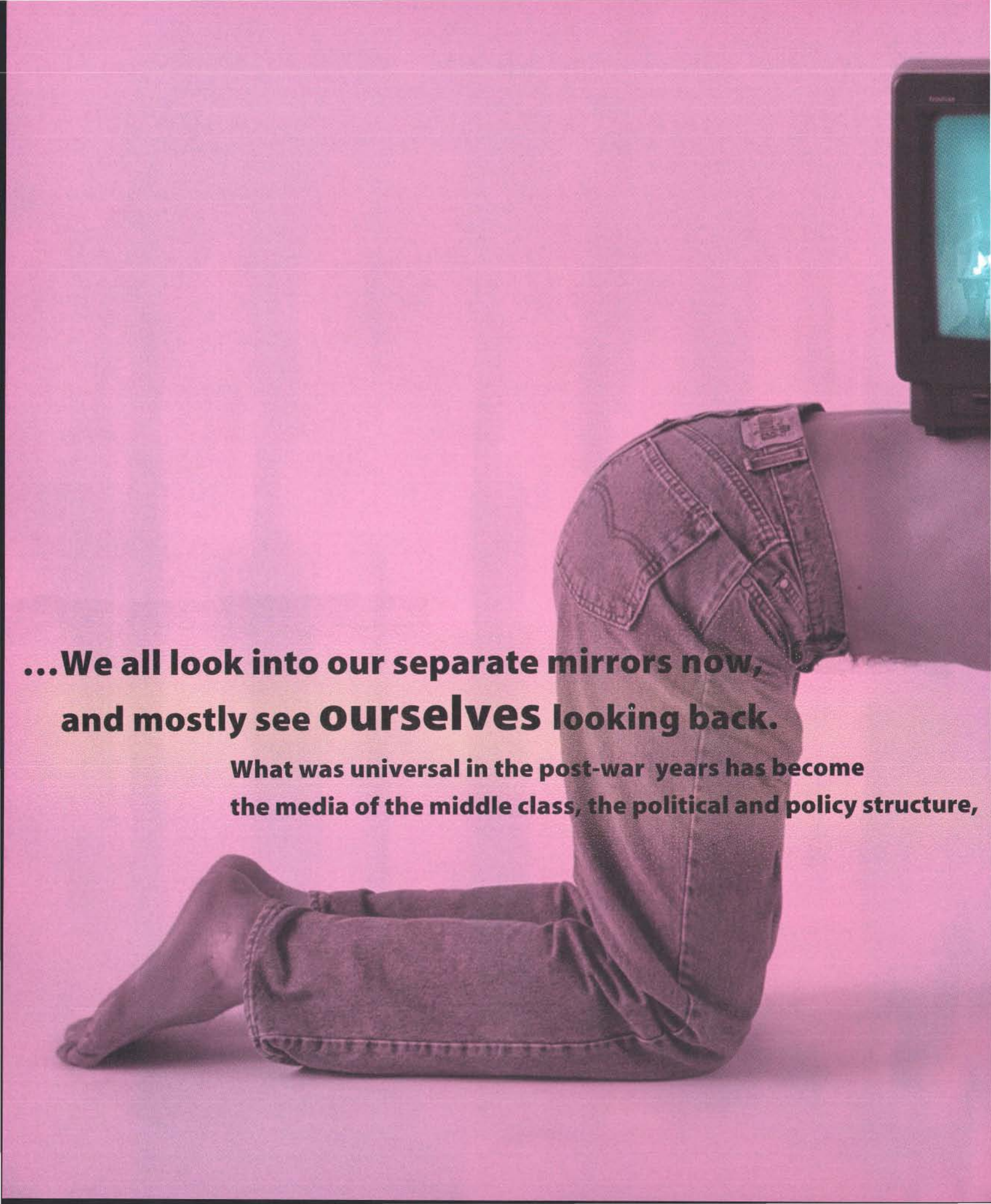


"A generation ago, almost everyone shared common

A person's silhouette is shown from the waist up, holding a flaming torch. The torch is lit, with bright orange and yellow flames. The background is dark and textured, possibly a night sky or a dark wall. The overall mood is dramatic and symbolic.

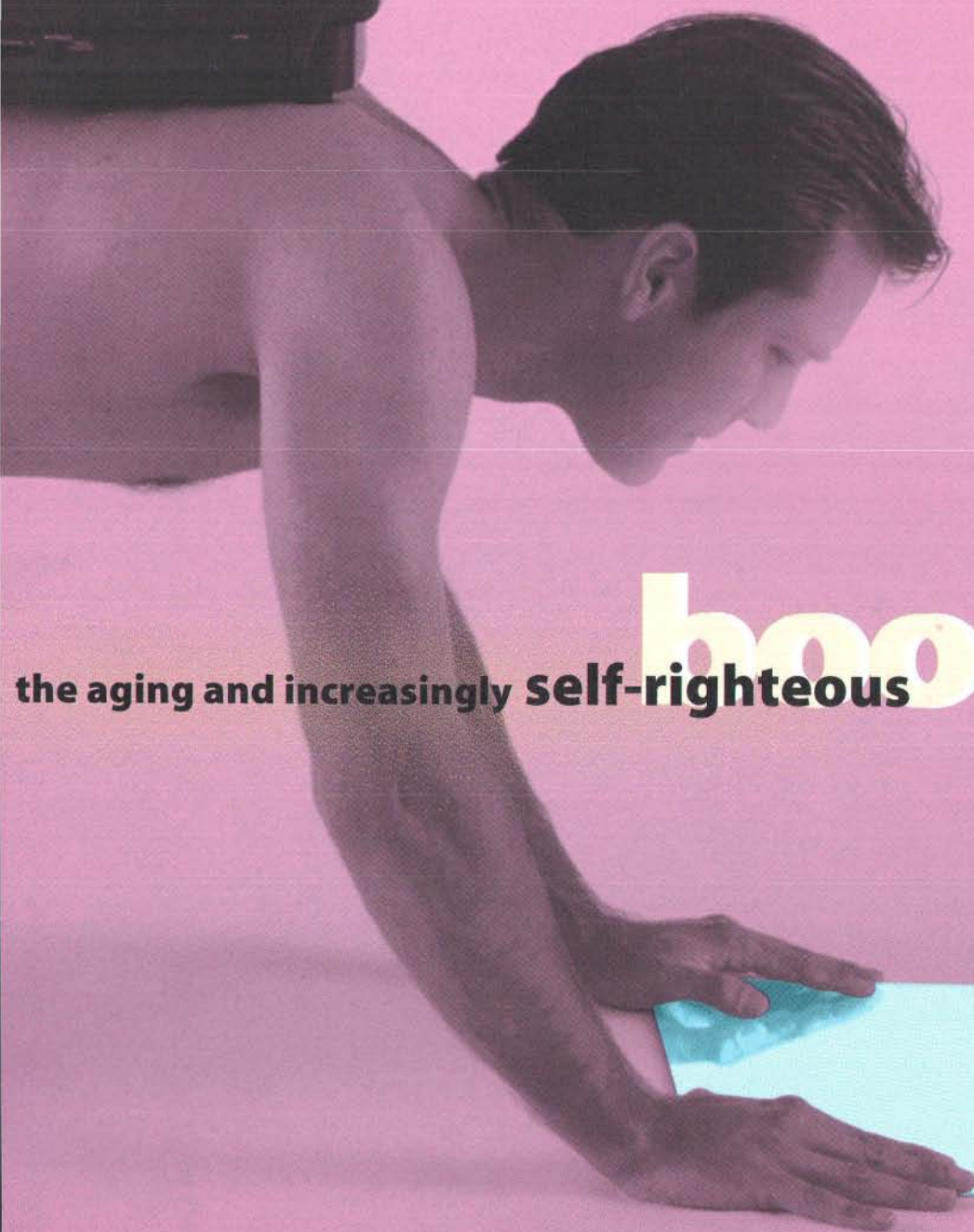
media.

That universality has been **shattered**, probably for good.
Information now splits along demographic, political and cultural **fault lines...**

A person is sitting on a light-colored floor, wearing blue denim jeans. They are positioned in the lower right portion of the frame, with their back to the camera and their head turned towards a television set. The television is a small, dark-colored model with a glowing screen, located in the upper right corner. The background is a plain, light-colored wall. The overall lighting is soft and even.

**...We all look into our separate mirrors now,
and mostly see **ourselves** looking back.**

**What was universal in the post-war years has become
the media of the middle class, the political and policy structure,**



boomers."

the aging and increasingly self-righteous

— Jon Katz, page 126

-
- 30 **Rants & Raves** Reader feedback
 - 43 **Electric Word** Bulletins from the front line of the Digital Revolution
 - 53 **Fetish** Techno-lust
 - 60 **Reality Check** The future of CDs
 - 62 **Raw Data** Stats 'R' Us
 - 64 **Geek Page** Postcards from the edge

ELECTROSPHERE

- 68 **Making Every Vote Count** By Erik Nilsson
- 74 **Bringing Up RoboBaby** By David H. Freedman
- 82 **Media Typhoon** By Jeff Greenwald
- 88 **Power to the People** By Evan I. Schwartz
- 94 **Toon Town** By Douglas Cooper
- 106 **Ka-Booom!!** By A.J.S. Rayl
- 114 **Consume the Minimum, Produce the Maximum** By Michael Goldberg
- 126 **Natural Born Killjoy** By Jon Katz
- 132 **A Couple of Hyped Guys Sitting Around Talking** By John Battelle

context

IDÉES FORTES

- 141 **Watching the Detectives** By Sandy Sandfort
 - 142 **Persistence of Locality** By Fred Hapgood
 - 144 **And Now, a Word for Our Sponsors** By Chris Clark
-
- 181 **Street Cred**
 - 195 **Net Surf**
 - 198 **Deductible Junkets**

216



Beautifully Bizarre

The B Book. By Jessie Scanlon

-
- 222 **Nicholas Negroponte**

146



Gang War in Cyberspace

An anonymous member of the Legion of Doom calls a member of the Masters of Deception a "nigger" – and in the loose-knit hacker underground, nothing is the same again. By Michelle Slatalla and Joshua Quittner

152



The Creators

Twenty-five years ago, they brought the Internet to life. By Katie Hafner
With an interview of Vint Cerf, head of the Internet Society. By Steve Cisler.

156



State of the Art

Digital technology is eroding the foundation of the elite contemporary art world – and the very concept of art as commodity, threatening to make the overheated art market of the '80s seem like the last gasp of tulipomania. By Daniel Pinchbeck

160



Free Radical

The visionary design work of Dan Friedman. By John Plunkett

162



Not Problems, Opportunities

The transition from government monopoly to private competitor has been difficult for Japan's largest company. But necessary. An interview with the president of Nippon Telegraph and Telephone, Masashi Kojima. By Izumi Aizu

166



Rockin' with Mr. Bill

He's the richest guy in America. He's got opinions. Here are some of them.

168



A Crazy Shade of Winter

His CD-ROMs featuring Beethoven's *Ninth*, Mozart's "Dissonant" Quartet, and Stravinsky's *Rite of Spring* are probably the most satisfying ever made. Now he's about to take on rock and roll. By Ray Sawhill

172



Tank Girl Stomps Hollywood

She's going to the big screen her way. By John K. Bates

174



E-Money (That's What I Want)

The killer application for electronic networks isn't video-on-demand. It's going to hit you where it really matters – in your wallet. It's not only going to revolutionize the Net, it's going to change the global economy. By Steven Levy

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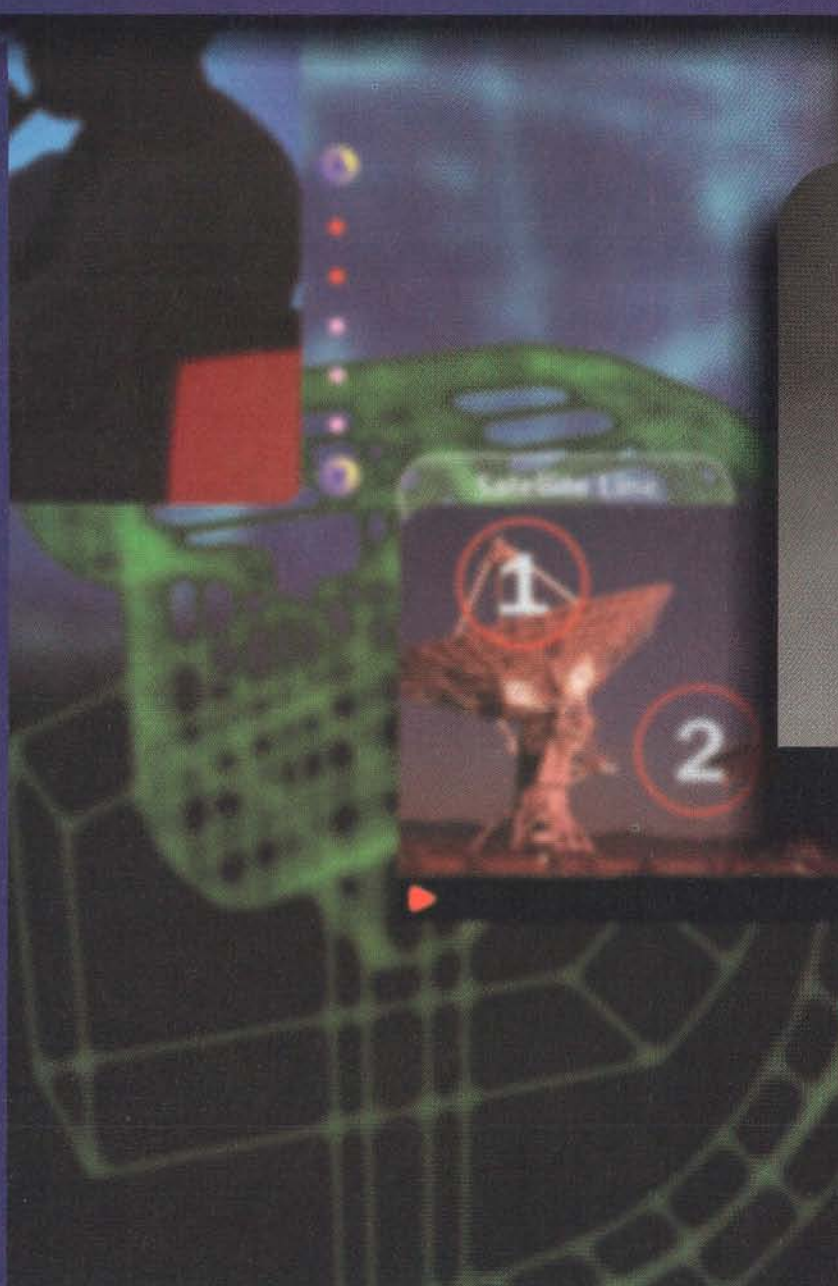
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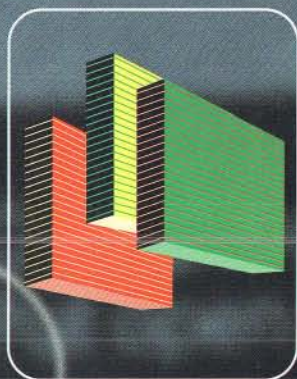
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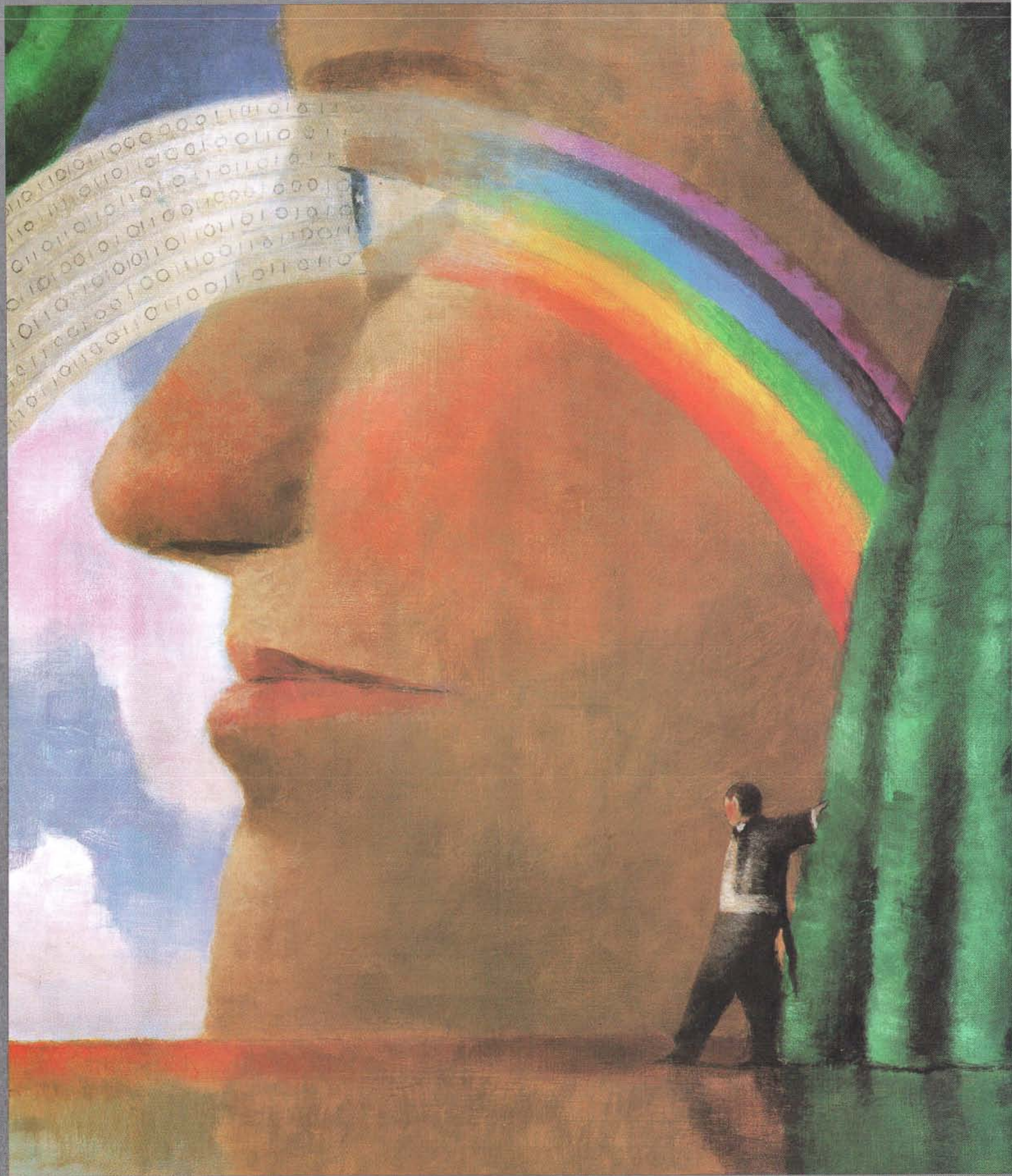
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a computer.



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talk on the speakerphone or watch your favorite TV* show on it? (Yes, there's a TV in there, too.)
Who knows, maybe it's just that it costs less than you think it should.
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 "In the name of progress,
our official culture is striving
to force the new media to
do the work of the old."

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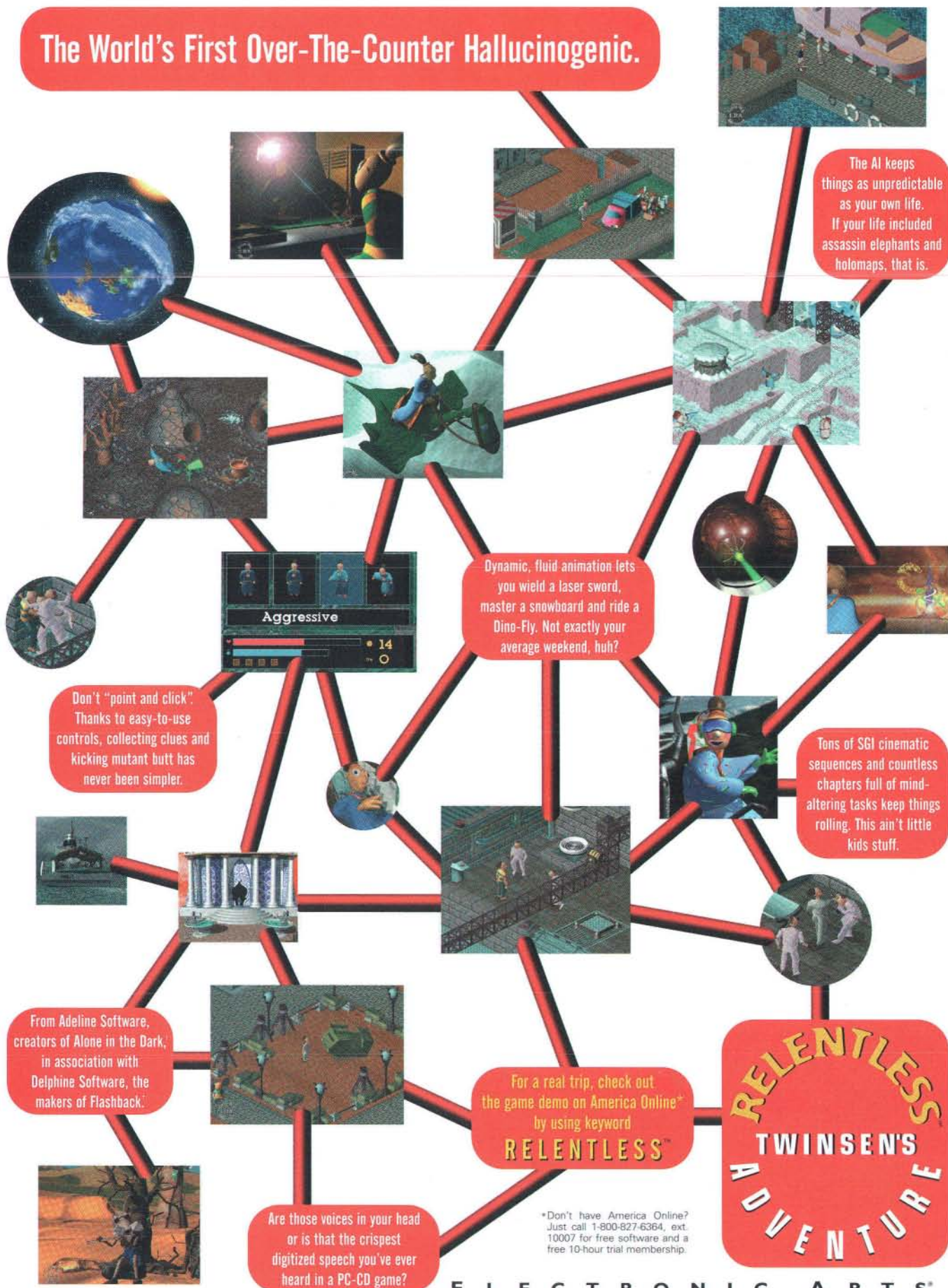
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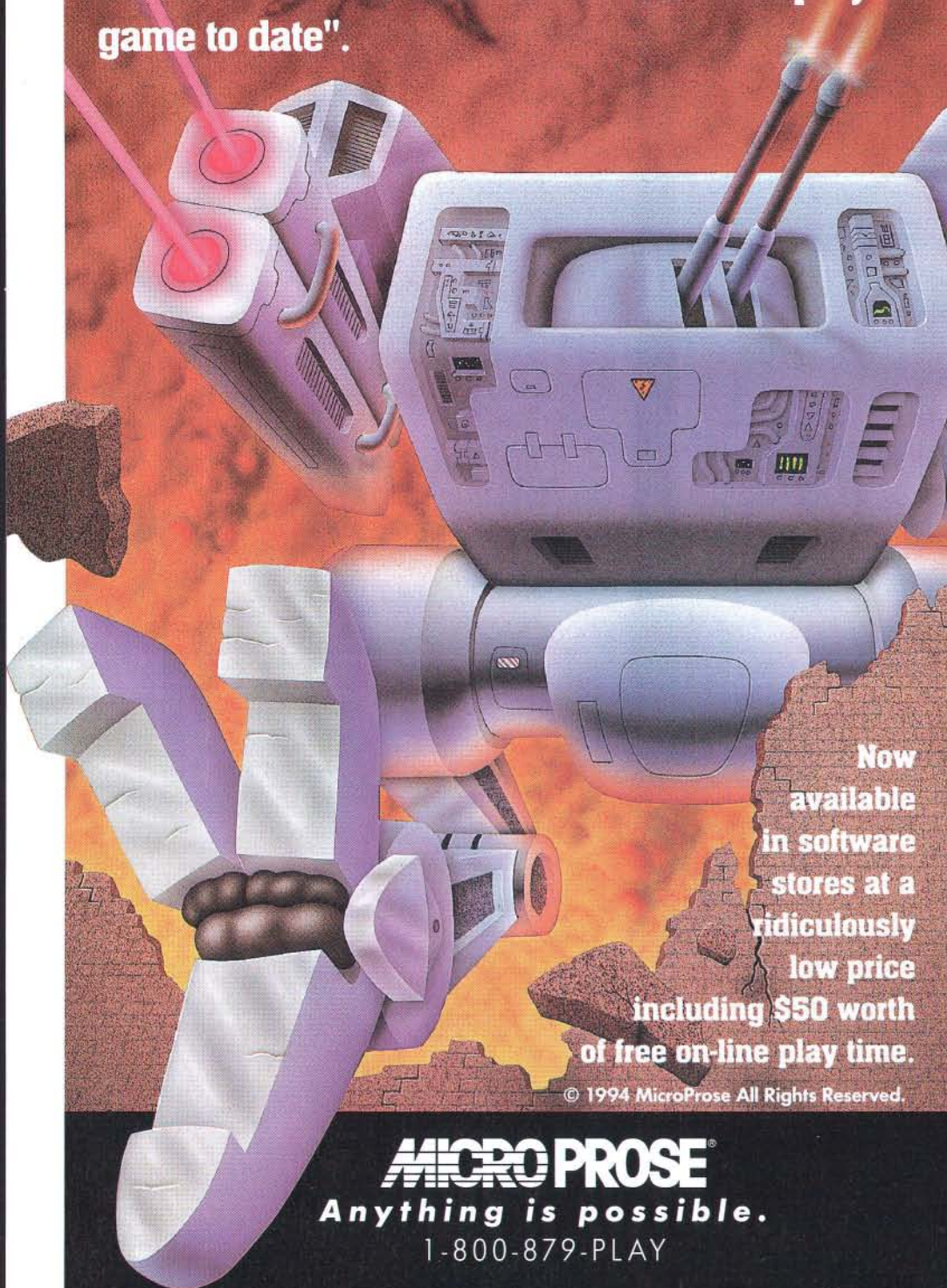
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Mark Kvamme is President & CEO of CKS Partners, Inc., a full-service advertising and marketing communications company with offices in Silicon Valley, San Francisco, Portland and London. CKS' stellar achievements include the redesign of United Airlines' corporate identity system and the merchandising system for the Apple Newton launch. Given their total commitment to Macintosh technology, it's not surprising that CKS was one of the first to get Radius' new LeMansGT graphics accelerator card.

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Rants & Raves

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No Fooling

The faking of the Apollo missions ("The Wrong Stuff," *Wired* 2.09, page 108) is in fact testable, thanks to the fact that three laser reflectors were placed on the moon during Apollo missions 11, 14, and 15. These corner mirrors are used for lunar laser ranging, whereby laser pulses are sent to the moon, reflected off the mirrors, and returned to earth. By calculating the travel time, the distance to the moon from the laser site can be determined to within a centimeter.

Lunar-ranging experiments, which have been ongoing for 25 years, have been instrumental in testing Einstein's general relativity – specifically the equivalence principle, which states that the inertial and gravitational mass of a body is the same, independent of the body's composition. These experiments have also been useful in improving the ephemeris detailing of the Earth-Moon system's orbit about the Sun, and long-term studies of variations in the Earth's rotation and polar recession. Full details of the practical usefulness (such as advancements in atmospheric modeling) of this knowledge is unfortunately beyond the scope of this letter.

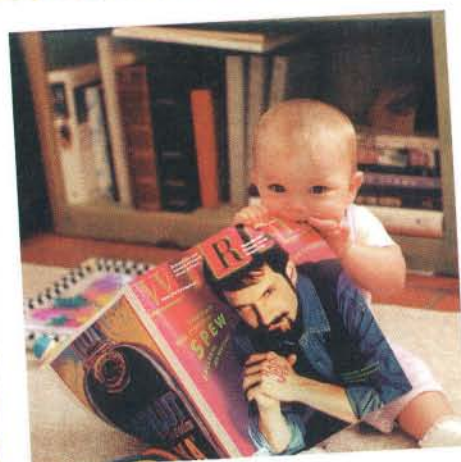
Any individual who questions the lunar landings can, in principle, buy a 3-Joule laser, a large collecting mirror (1-3 meters in diameter should suffice), and a photo tube to detect the reflected light. With the exact coordinates of the reflectors (which someone at NASA should be willing to supply), conspiracy theorists could see for themselves that these reflectors are, in fact, there. As the lunar surface is bumpy and as good a mirror as dirt, it would be difficult to fake a signal from one of these reflectors.

Kevin D. Green
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What bothers me is not the idiocy of Bill Kaysing's ideas of "superfraud" and ultraconspiracy, but the broad ignorance it perpetuates among an American public already suffering from a decades-long decline in math and science education. Further, I find *Wired's* attempt to provide both sides of the story pitiful and irresponsible, allowing only a thin sidebar for NASA's

response to the multiple-page article of unsupported allegations.

Further, as an employee of a NASA-funded project, and based on my limited experience and exposure to the current bureaucracy of NASA, I must contend that it would have been impossible for such a sophisticated and secretive project to be even dared due to the blatant incompetence and mismanagement that has always plagued that agency. In my opinion, it was *much easier* for NASA to put men on the moon



One of *Wired's* quality-control consultants, hard at work determining the devourability of 2.10.

six times – with all the engineering obstacles and challenges – than to concoct an illusion, repeated and undiscovered by a world audience of scientists and enthusiasts.

To *Wired's* editors, I say, leave the superconspiracy theories for *The X-Files* and stick to things a bit more wired (and a lot less tired).

Mason Wong
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Penn-Based Computing

Unaccustomed as I am to satire in the pages of *Wired*, I was caught off-guard by the outrageously funny article on Penn Jillette ("Penn," *Wired* 2.09, page 97). It took a while, but finally, all the little clues

began to add up: the "this is not *People* magazine" disclaimer, the comparing of Jillette (favorably!) to Stephen Hawking, the fact that he owns only one dinky computer (attention BBS sysops: you've got too much hardware), and so on.

Congratulations for having the inspiration to run a piece that so imaginatively and hilariously skewers the values you've held up as worthy in the past. You did a clever job: painting a picture of someone with no social conscience, no worthy struggles, no desire for change – in fact, no redeeming quality at all save that of being entertaining. Yet this self-absorbed, hedonistic couch potato is laughingly deemed worthy of note and even emulation, were we only rich enough to do so. Satire like this helps us all keep our balance and sense of purpose in these rapidly changing times.

Kudos to Mr. Jillette for his totally convincing portrayal of a shallow, narcissistic, self-indulgent asshole.

Ted Reynolds
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The article on Penn Jillette was an exercise in idiocy. Why was it necessary to waste pages of an otherwise tasteful magazine on this adolescent male in a man's body? Yes, he's into hi-tech gadgets, computers, and other cool stuff. But surely you could have found a more interesting person to interview who would also have demonstrated maturity, tastefulness, and self-discipline – the hallmarks of a well-adjusted adult, and qualities that are totally lacking in Mr. Jillette. Behaving in this manner for his act is one thing, but adopting it as a way of life is pretty pathetic.

My condolences to Joshua Quittner for having to write the thing.

Audra Russell
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Let's see if I've got this straight: Penn Jillette wanted to get digital. So he went out and hired a "geek" who "does [his] computer stuff" – thereby avoiding the tedium of actually learning about it on his own.

And you think this is possibly The Most Wired Man in America?

Granted, absorbing knowledge is an awful bore,



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especially when you've got more important things to do. Like watching *Leonard Part 6* three times. Sure beats reading a manual. Or maybe the fact that the geek wears rollerblades, yet another manifestation of Penn's unutterable hipness, is what really counts.

Phillip Finch
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If Penn's way over the top on the Nerd Index, nerds are in deep shit.

Ted Dracos
San Antonio, Texas

More Static

Although I'm not surprised, it is kind of disturbing to read rants by readers who object to stories like "alt.sex.bondage" or "Rage." When I lay down five bucks for a new issue of *Wired*, I don't expect to be pleased by every article or story. Like the Internet, *Wired* contains some information that doesn't interest me. I like *Wired* because of its diversity and want you to keep it up. I hope these objections by whining readers who threaten to quit reading don't force *Wired* to become just another mainstream rag that I use to catch oil drips in the garage.

Ron Bearry
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Seattle, Washington

The Meter's Running

I read with enthusiasm Brad Cox's recent article ("Superdistribution," *Wired* 2.09, page 89). As a software publisher, I am interested in and excited by new forms of distribution: I find the current methods inferior, and also believe that somewhere in the amorphous concept of "meterware" there truly is a better way.

I am struck, however, by certain hang-ups that seem weightier than Brad Cox suggests. Provided that narrowband distribution is all that we currently have in the mass market, I fail to see how meterware is a viable concept. In a meterware situation, where a user is billed per use, I see no economic viability in sending CD-ROMs to people who want them before they pay for them. Yes, CDs are only about US\$1.50 to me. But, if 1 million people want them, that is a big cash-flow hit.

Also, I'm troubled by the piracy issue. Any system developed to track billing will be a hot target for piracy. Knowing computer gamers, they will not only discover a way to break in, but will also spread this new method to all of their friends over the Net. As a publisher, I am in deep trouble if this comes to pass.

Revenue sharing is also a huge issue. Who is to decide the split? In a cable TV situation, revenue sharing is a negotiation between publisher, distributor, and local operator. Is there a likely parallel in the digital domain?

Finally, problems might arise when companies like Apple, whose QuickTime software is essential for viewing video (Apple currently charges developers a US\$50 fee for a QuickTime license allowing for free unlimited distribution with a CD-ROM), may not be so generous in allowing QuickTime to be distributed on a mass scale over the Net. We will still need Apple's permission to do so.

I am intrigued by the possibility of meterware and how it could aid and enhance current forms of software distribution. But the issues of piracy and tampering are huge. With products developed by private enterprise, and with the potential to distribute a tampering method to millions of people, there are staggering implications, and publishers cannot afford to be watchdogs in this case.

David Herschman
74014.3021@compuserve.com

David, your comments help to bring out several crucial points about superdistribution that I didn't have space to address in my article.

Superdistribution is not intended as a short-term solution to the practical CD-ROM problems you face today. There are simpler solutions available, such as calling an 800 number for a decryption key. Superdistribution's goal is to address two critical limitations of such acquisition-based approaches. The first is that once a customer decrypts a product, existing solutions provide no obstacle to making additional unpaid copies. The second is that existing approaches don't support revenue flows to subcomponent providers, only to the owner of top-level components such as computer applications.

Both of these problems are so fundamental that they're rarely articulated. But since they determine who can get paid for what granularity of product, they shape the entire software industry as we think of it today. Superdistribution's purpose is to provide a revenue mechanism that might allow the software industry to redefine itself, just as manufacturing redefined itself during the industrial revolution. That is, instead of each programmer fabricating everything he/she needs from first principles, they will instead assemble large components from stockrooms of prefabricated subcomponents.

You're "troubled by the piracy issue." You should be. Existing solutions leave you completely exposed to piracy. Your concern with superdistribution will manifest if the metering infrastructure is implemented in a tamperable form such as software. This is why the metered approaches I know of (Ryoichi Mori's Superdistribution system and Wave Systems's chip) emphasize tamper-resistant silicon technology.

As for your closing point regarding publishers as watchdogs, you may be correct in the short term, but you articulate a mind-set that can be exceedingly dangerous in the long. — Brad Cox

Just Browsing

"Berners-Lee and his colleagues faced the problem creating a unified hypertext network ... in a diverse international environment. They came up with a stunning solution. Rather than attempt to impose standards on the hardware or software, they defined standards for the data" ("The (Second Phase of the) Revolution Has Begun," *Wired* 2.10, page 116).

While this is indeed a stunning solution, and Tim Berners-Lee and his colleagues deserve a great deal of credit and praise for using it, they certainly did not invent it. The standard they chose, SGML, or Standard Generalized Markup Language, has been an ISO standard since 1986 (ISO 8879). Its technical and intellectual precursor, GML, was developed in the early 1970s and was part of the IBM DCF/Script text formatting product starting in about 1982. Many large enterprises, not least of which IBM, recognized the tremendous benefits of data standards.

One reason Mosaic is so popular is that it defined support for new elements or new combinations of elements that were not in the original HTML definition, giving it a significant competitive advantage over other browsers. This meant that if you created a document that worked with Mosaic and used its unique features, it might not work, or not work as expected, with other browsers. This, of course, erodes the value of data standards in the first place. Rather than having the standard extended by controllers of the standard, it was extended unilaterally by Andreessen, without any sort of check or control. One of the benefits of standards is that changes to them are usually made according to some protocol that ensures at least a little bit of review and consensus by the parties interested in the standard.

So, while Mosaic is very cool, and offers some very nifty functions, it has at the same time served to undo to some degree the very intent of the original Web designers by effectively wresting control of the data standard from the owners of the standard (and the data that conforms to it), thereby placing it in the hands of the developers of a specific product. The chief purpose of SGML is to prevent exactly this sort of extortion on the part of product vendors by keeping the control of the data format in the hands of data owners.

This said, it should be stressed that the World Wide Web is very important precisely because it does prove the basic premise of data standards in general and SGML in particular, which is that by focusing on data standards, you can enable exactly the sort of distributed access to information that the Web provides. While there are certainly flaws in HTML, the URL mechanism, and the various Web browsers, to a large degree they don't matter (no matter how much SGML pedants like myself may carp about them). Berners-Lee and his team were right and have built something wonderful. The job now — which many people are involved in — is to refine the system.

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Eliot Kimber

kimber@passage.com

Mountain View, California

Nihilistic Traps

How refreshing that Rob Fulop is beginning to worry about the effect of videogame violence on kids, and how silly of us not to have seen the humor in *Night Trap* ("Night-Trapped," *Wired* 2.10, page 76)! The scene that Ron Martinez refers to as "someone ... attacked with a drill," could be more aptly described as "a young blonde woman clad in revealing lingerie being attacked by a group of men disguised in black, choking her brutally with a pipe while she kicks and screams frantically for her life, as the camera lovingly captures the drill slowly moving toward her to disfigure and maim her." What laffs! Eroticizing sexual violence – "Let's do it for the kids!"

As for Fulop's bizarrely authoritative statement that "12-year-olds don't know how to make up a story," I have absolute faith that there is a vast generation of young people with the imagination and dreams to weave fantastic stories that would put Fulop's 10th-rate slasher movie rip-offs in dismal perspective. If only our culture rewarded and encouraged these kids by providing an outlet for their creativity, instead of supporting the vendors who target children with nihilistic mind-candy.

Spare me the excuses about being misunderstood, the complaint of being persecuted by humorless prudes. I'm not a moralist, a rabid feminist, or an advocate for censorship. I've a great appreciation for true wit, humor, and satire, but the alleged humor of *Night Trap* is abysmally unfunny, dehumanizing, soft-core snuff entertainment, courtesy of some Boomer's retarded sexuality.

Malachy V

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Big Brother Bill

Microsoft plans to "provide" online registration for Windows 4.0 (aka Chicago). I've participated in Microsoft Beta tests. You run its diagnostic program that interrogates your machine; it then spools out a listing of your hardware/software environment which is returned to Microsoft as part of your Beta site agreement. CRN tells us that Chicago will have an online registration "feature" (aka key security for software) that will only activate the program *after* you've gone online with Microsoft and dumped your diagnostic file – a file that's generated by unknown software checking out everything on your computer from the type and size of your hard disk to the contents of your DOS autoexec.bat file (verbatim!). Getting the picture yet?

How about a wild hacker at Microsoft also including in the interrogation a copy of your msmoney.mny file (the database for Microsoft Money), which contains – among other things – your bank account and credit card numbers, and balances. Sure, I trust Microsoft. I also trust my children. Yet even they don't get to snoop through my hard disk. Bill doesn't get to either.

The Clipper Chip is an interesting exercise in "what-ifs." The online registration for Chicago is Big Brother today – 1994. We are there.

Grady Blount

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Busted!

The cover of *Wired* 2.10 claims "Absolutely nothing about OJ Simpson in this issue." We here at Sony Music Mac Tech Support contend that the Fetish item on page 44 definitely counts as OJ material ("Don't you hate it when you've got to get to work but your favorite celebrity is facing a jury on national TV?").

We'll forgive you this time, but try to keep OJ out of it, OK?

Caroline Oudin and Matthew Smith

New York, New York

M(onopoly) TV

I was amused by the blurb entitled, "M(onopoly) TV?" (*Wired* 2.10, page 38). I'm wondering, what is a music video if not a commercial for the record? I wouldn't pay copyright fees to run a commercial. The MTV model has been around for years; I think they call it *radio* (MTV – pix = radio). I don't understand why big labels want to make it difficult for an outlet to play their videos since the ultimate goal is to move CDs. MTV pays an annual ASCAP/BMI fee, as do radio stations, and that's OK, providing some of it trickles down to the artist.

It looks to me as though both sides have lost perspective.

James Eaton

JEaton@aol.com

McInternet Dangers

Joshua Quittner's article "Billions Registered" (*Wired* 2.10, page 50) brought to light the fact that many Fortune 500 companies had not claimed obvious domain addresses, thereby staking their claims in cyberspace.

As an employee of one of those very large, very conservative companies, I offer another viewpoint. Many of "those in charge" at such sites view the Internet as a large dung heap within which live the dreaded hackers, phreaks, and other cybertrash. Not IMHO, but reality nonetheless. Let's assume that these companies can, in fact, be convinced that the Net has some intrinsic value and should be exploited. Their anxiety-riddled infrastructures will prefer

anonymity over public visibility, seeking safety in curiously encoded domain names that hold meaning only for the initiated.

Two things large companies fear most on the Net: 1) attack or infiltration by outside forces with some destructive motive and 2) bad PR, somehow attributed to the organization by its visibility in e-mail addresses, Usenet postings, etc. An obvious domain address like mcdonalds.com scares the hell out of Net administrators in big business.

Leave the trademark issues to the lawyers who will, with certainty, "Big Foot" the offending parties out of sheer habit. Internet access will be controlled by the techno-drones who will be ordered to supply service with discretion. Thus, you might see Sara Lee appear as sle.com; "SLE" being its NYSE ticker symbol.

John A. Lock

lock@netcom.com

Demand is Key

"Fran on Demand" (*Wired* 2.09, page 60) sounds like a phone-sex line (no offense, Fran), and *that's* what could drive all the video-on-demand products in 1996, 1997, or whenever. Sex. We've all heard about the French Minitel network and how sex is what provided French Videotext services with their staying power. America will be no different.

I agree completely with Evan Schwartz that video-on-demand will be sorely lacking. The big players in the industry aren't interested in displacing Bob Guncione. And people *like* to browse.

I launched a low-tech video-on-demand service in Toronto in 1992. Even lower tech than Fran. We delivered videos in cars. Like pizzas. Our costs would have allowed us to make a profit, *if* we could have generated some *demand*. The service shut its doors six months after launch.

Even with free membership, free first rental, and a no-tipping policy, we still couldn't generate enough demand. The porno videos flew off the shelves, but I, like Wayne Huzinga, wanted to be proud of my service, and decided to limit the adult collection that was offered.

As with most things, it takes all kinds. Some people want video-on-demand. Some people want to browse. Some people just want to read a good book. Videos didn't put Cineplex Odeon out of business. Video-on-demand won't put Blockbuster out of business either.

Sanjay Singhal

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Caption Credits

I was pleased to read the story on movie captioning in the September issue ("Personal Movie Captions," *Wired* 2.09, page 33) but was dismayed to see that it did not recognize the efforts of the CPB-WGBH National Center for Accessible Media (NCAM) or the



A face is like a work of art.
It deserves a great frame.

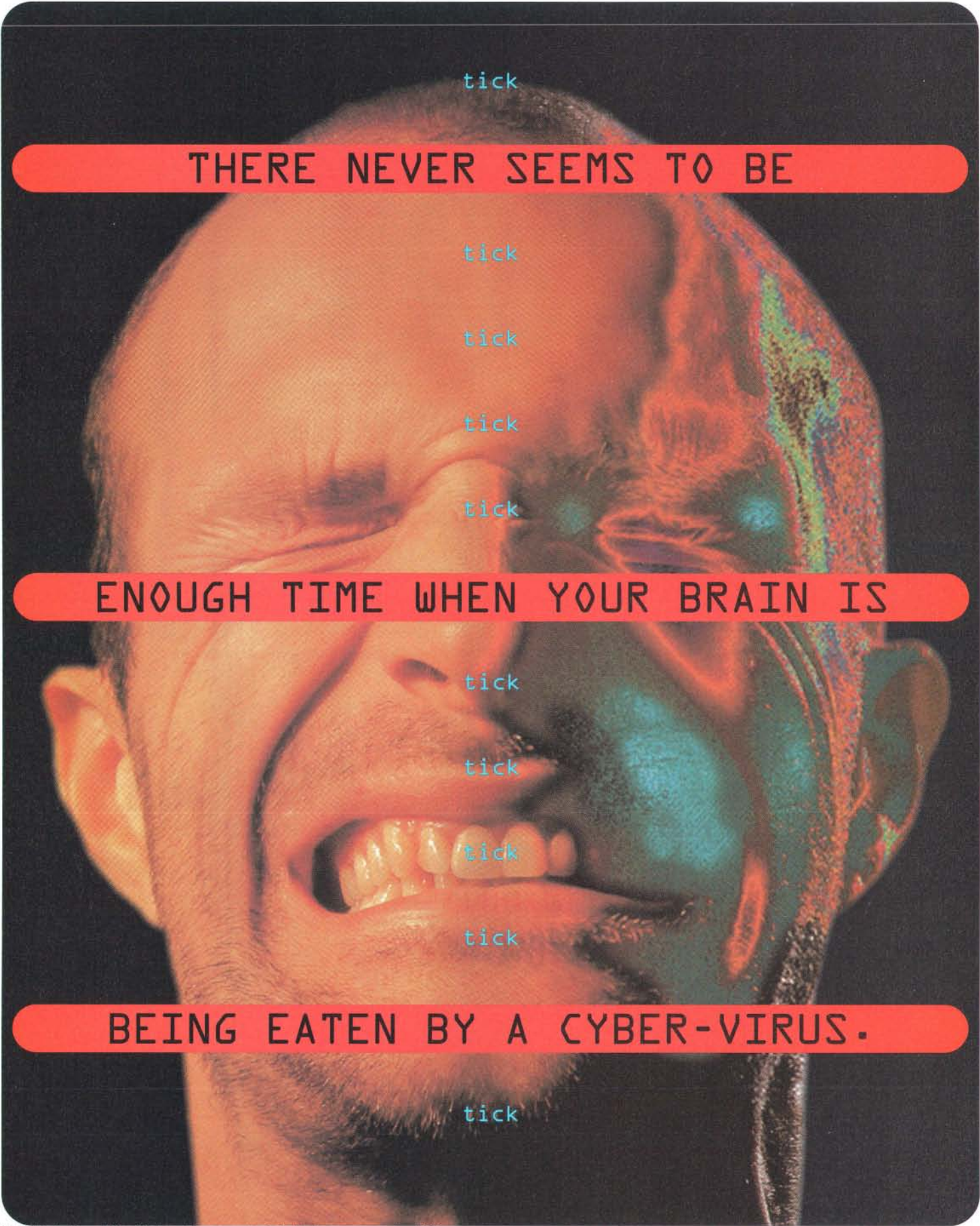
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A portion of the proceeds from Luck will be donated to the Aileen Getty House for Women With AIDS, a project of Homestead Hospice & Shelter.



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tick

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PHILIPS MEDIA

financial support of the National Institute on Disability and Rehabilitation Research (NIDRR), US Department of Education.

NCAM has been exploring the issue of closed captioning in movie theaters since 1991. The screenings at the National Air and Space Museum were modeled on an earlier field test that NCAM conducted at a conventional movie theater in Boston. Although the Air and Space Museum raised their own funds for the trial and the resulting installation, neither would have been possible without NCAM's initial research and development, which was funded by a US\$50,000 grant from NIDRR.

The Motion Picture Access Project has received a tremendous amount of support from the movie industry and theater owners.

I believe that it is an oversight not to credit inventor Rufus Butler Seder of Boston, Massachusetts, and NCAM director Larry Goldberg, who co-developed the "Rearview" device featured in the article and have a patent pending.

Judith Navoy

CPB-WGBH National Center for Accessible Media

Judith_Navoy@wgbh.org

A Geo by any Other Name

In "The Ultimate Driving Machine," (*Wired* 2.07, page 98) futurist Amory Lovins hypes his concept of hybrid "super cars" as the "biggest change since the microchip." Give us a break! Proposing better fuel economy as the solution to today's transportation problems is the logical equivalent of proposing the breeding of low-manure horses as the answer to the transportation problems of the 1890s. A car with the size, payload capacity, and power of today's cars but with 150 miles-per-gallon fuel economy is not revolutionary. It's wishful thinking.

At highway speed, a 150 miles-per-gallon car operates at an average power output of less than 12 horsepower. That's just physics. In a hybrid, the motor would actually be tuned to a constant output of 12 horsepower. This is a motor somewhat less powerful than that of the Wright brothers' airplane. Storage devices would be used for any needed additional boost. Adding some minimal constraints on payload size and existing highway grades, one quickly discovers that the super car must be able to deliver 25 horsepower for sustained periods of time. This underpowered vehicle is not the perfect thing for fun on the autobahn.

Now try to take this vehicle through the standard crash-worthiness tests. Add a few hundred pounds of minimal protection for the passengers, and your super car is a Geo Metro with some plastic parts and an 80 miles-per-gallon fuel consumption. Hardly a technological revolution.

Tim Bailey

74577.2161@compuserve.com

The Heart (and Kidneys) of the Matter

I would like to add some input to the discussion in June's "Reality Check" (*Wired* 2.06, page 31). Regarding the heading "Universal Organ Donor Animal," pig organs and skin (used for burn victims) have been used for years. There are farms and labs that raise pigs specifically for this purpose.

Regarding the great organ donor shortage, in this country, the only shortage of organs is that of *guts* when it comes to government officials and agencies that control this business. That is why, for years, I have been sending organ recipients to other countries for transplants. There are fewer waiting lists, and immediate transplantation is usually available.

There are approximately 300,000 people worldwide in need of organ transplants. About 100,000 of them are in the US.

It's a shame that people have to die in this country as they wait for organs, because of the edicts of special interest groups.

Jim Cohan

Transplant Coordinator

Los Angeles, California

The Power of Paper

Your article "Online or Not, Newspapers Suck" (*Wired* 2.09, page 50) was quite interesting, but revealed a typical American stance on newspapers.

There is no way that newspapers can compete with electronic media of today for actuality and up-to-date news. And I believe that most newspapers have already realized this.

But the one thing that only a newspaper can give me is a thorough summary of events, delivered with a specific point of view. This accounts for the plethora of papers available: each presents the same information, however, I get to choose the paper that best matches my own world view and politics. No online service yet has this kind of personality simply because it is not the objective.

Though I might search the Net for pure information, I will always stick to my paper for in-depth coverage and opinion – and I can do so while sipping my coffee on the porch (another thing you can only do with a good, old-fashioned newspaper).

Ulf Schorling

Borgwedel, Germany

Wiring Africa

I just received *Wired's* June issue in Ethiopia and read "Wiring Africa" (*Wired* 2.06, page 60). The African networking situation is not as bleak as it would seem. A number of efforts are underway by various networking projects such as ORSTOM, CABECA, and RINAF to address Africa's infrastructure development.

At least 80 percent of African countries are now either fully connected to the Internet, or connected through e-mail gateways. Thanks to the assistance of several donor institutions such as the International

Development Research Center of Canada and others, many countries in southern Africa surrounding South Africa are just beginning to switch over to full Internet links.

Some countries, including Zambia, Ethiopia, and Zimbabwe, are building excellent, low-cost national networks that can easily migrate to full TCP/IP connection. The user base in these countries justifies a leased line cost.

There are other undocumented success stories that show the possibility of growing connectivity to the Internet via low-cost networking centered around the growth of national capacity. This is far better than "leapfrog" solutions under the "bread/modem" choices in the region.

What is needed is more training, collaboration, sensitization, and assistance in national networking efforts, and the development of an infrastructure that supports networking. This is not a choice between maize and modems or some costly form of leapfrog networking, but a global infrastructure-building effort that will ultimately bring full Internet access to Africa; one that serves not only PANA, but also a government, a businessperson, a professor, or a field worker equally.

Lishan Adam

Lishan@padis.gn.apc.org

Network Project Coordinator, PADIS

Addis Ababa, Ethiopia

Undo

• ATT's Edge, listed in Fetish (*Wired* 2.10, page 44), died in the transition from vapor to solid form. We apologize if we got your hopes up. • We neglected to give credit where credit was due in issue 2.10's installment of Raw Data (i.e., the source of the data). We thank the Semiconductor Industry Association. • We most humbly apologize for the miscredit on page 116 of *Wired* 2.10 ("The (Second Phase of the) Revolution Has Begun"). The Whole Frog Project Mosaic page displayed was actually the work of the Lawrence Berkeley Laboratory and was sponsored by the US Department of Energy, Energy Research Division, Office of Scientific Computing. John Cavallini served as the program manager. Lawrence Berkeley Laboratory is operated by the University of California for the DOE under contract DE-AC03-76SF00098. We inadvertently attributed the page to the University of Virginia. For more, see Net Surf this issue. • To clarify: when ordering the *Woodblock to Laser* CD-ROM ("Digital Dharma," *Wired* 2.08, page 54), please be aware that the minimum donation is US\$15 and that the text is *transliterated*, not translated.

Send your Rants & Raves to:

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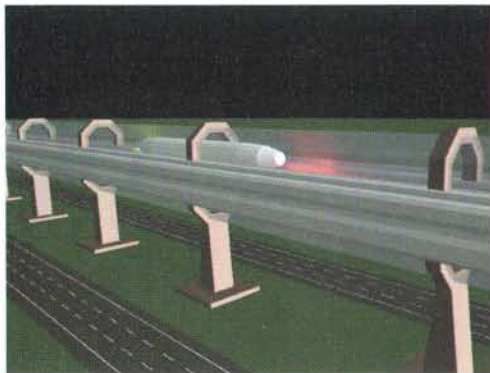
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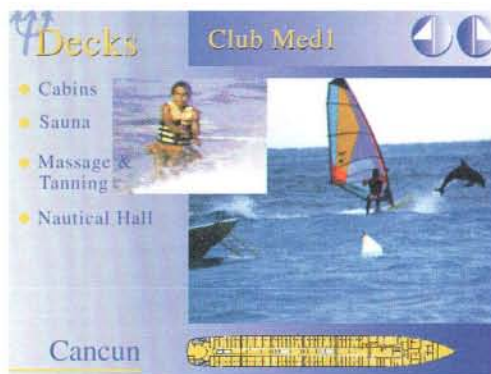
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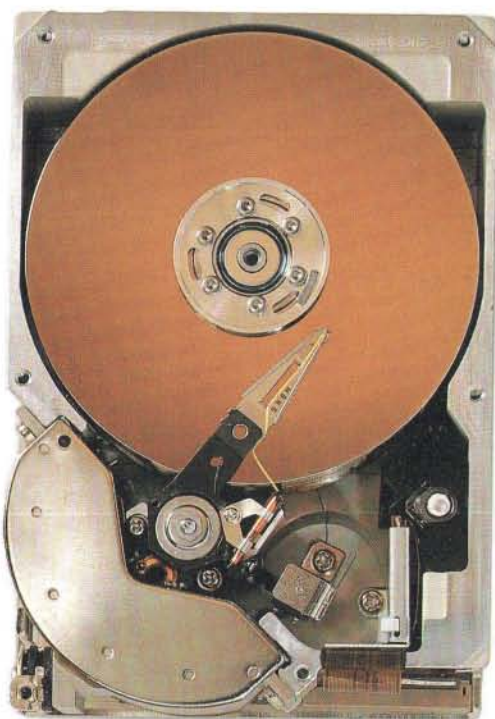
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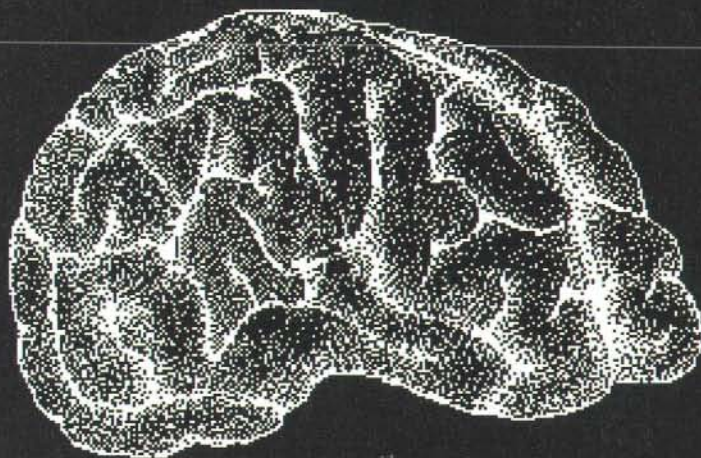
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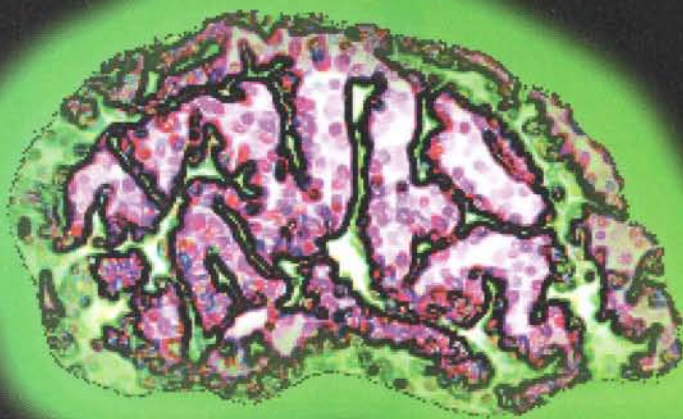
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Playing a videogame can seem like a matter of life or death. But for the truck drivers at the R.F. White Co., it's at least a matter of livelihood. Each morning, they line up behind a computer. Their 15-second task: to keep a squirming green blip on the screen by twiddling a knob.

The computer prints out the test results, which the drivers

then exchange for the keys to their trucks —

unless they fail the test.

Those who score below

average in four consecu-

tive tries are rewarded

with a day off — without pay. These drivers are, or so their employer insists, too drunk, drugged, stressed out, or exhausted to safely maneuver their rigs. Come back tomorrow, they are told.

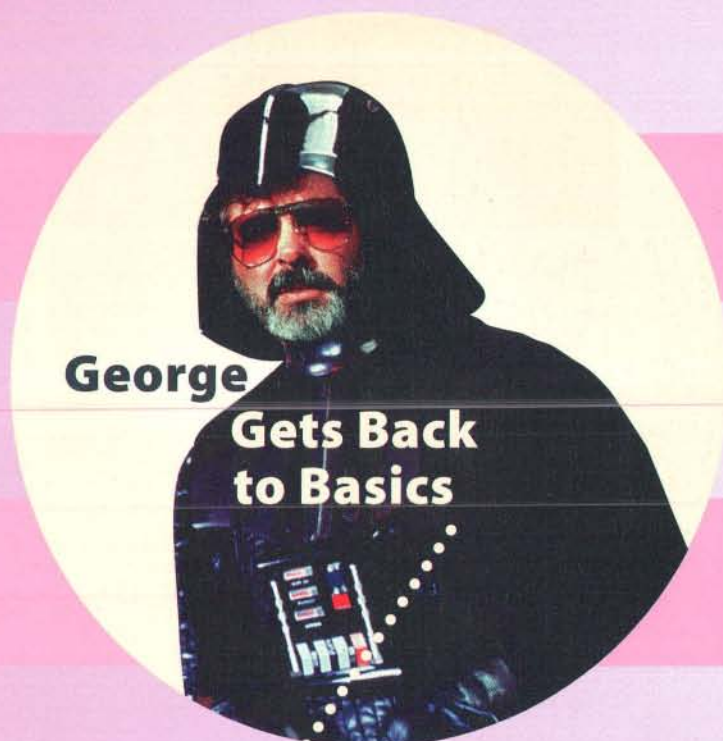
According to an article in Baltimore's *The Sun*, almost nine out of ten large employers require workers to hand over urine samples for drug tests. A computer game to test alertness would do away with most of civil libertarians' objections to urine tests. (Being forced to submit the samples goes against principles about privacy and the right not to incriminate oneself.) Also, urine tests are useless for weeding out workers whose emotional state could hurt their performance. In fact, the American Civil Liberties Union has referred employers with concerns about worker safety to companies like Performance Factors Inc. and Essex Corporation, who market the computer safety programs. These businesses are big on the idea that urine tests are inconvenient, invasive, and, well, yucky.

But there are legitimate concerns over the computer testing. It is possible to fool the system. A person's test performance is measured against a series of initial, individual tries, which become the average score for that employee. All the clever drug user needs to do is deliberately play a few bad games during that initial series. The computer tests also make it impossible to distinguish between someone who's been snorting coke and a parent who stayed up all night with a sick child. (But then again, would you want either one of them driving a big rig the following morning?) Time will tell which of the two systems is most likely to scare the piss out of drug abusers who pose a safety problem. — Rogier van Bakel

Mandatory Videogame: Play or No Pay

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George Gets Back to Basics



≡ Happy Holidays: Just before they left for their election break, those well-intentioned folks on Capitol Hill left you and me with a ticking time bomb called the Digital Telephony Bill. Sure, thousands of you phoned, faxed, and e-mailed your opposition, but it passed the House and got *unanimous* approval in the Senate. God knows Mr. Bill (Clinton) didn't have the backbone to veto it. When you're facing the national security state, things get tough. It's not enough to build in vague, loophole-laden assurances of privacy (the EFF's claim to fame on this particular piece ►

W
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George Lucas's personal toy chest, Industrial Light & Magic Inc., is abuzz over early testing for the new *Star Wars* trilogy. Lucas, in an industry first, will lens all three films simultaneously. The three films are expected to boast dazzling new special-effects technologies, the result of Lucas's pioneering work in digital imaging. "I have available to me now a lot of things that I never had, so my imagination can go a little wilder than in the past," says the filmmaker. ILM President Jim Morris estimates that the original trilogy relied on computers for 1 percent of its effects, while the new films' effects will be 99 percent digital.

Creatures created for the first trilogy were made using foam costumes and go-motion models. The new beasts will be spawned

inside 50 newly installed Industrial Light & Magic character-animation workstations. "There were a lot of not-very-mobile creatures in the first *Star Wars* series that, we hope, we'll be able to move around a lot better. Jabba the Hut couldn't go anywhere before. Now he'll be going places," Lucas notes.

Since the prequel scripts have yet to be written, the new trilogy's ETA is fuzzy, though Lucas is hoping to have the first installment out in the latter half of the decade. Until then, restless space travelers can sate themselves with the remastered laserdisc set from FoxVideo/Image Entertainment (US\$249.95) and possibly a theatrical re-release of the original *Star Wars*, with new special-effects footage. — Paula Parisi





Set-Top Studio

Studio sets can be an expensive part of TV production. You need specialists to design them, costly materials to build them, space to store them, and a bunch of unionized workers to construct and dismantle them before and after every show. If the program changes, you have to throw the old set away and build a new one.

ELSET (Electronic Set System), an R&D project supported by the European Union, is likely to revolutionize TV production as we know it. The objective is to create digitally generated studio sets with photorealistic image quality and an interface that synchronizes the "virtual set" with live-action shots of real people in real time. When the camera pans, zooms, or tracks, the "virtual camera" in the computer-generated 3-D space performs exactly the same motion, including changing the focus. The light sources are also synchronized: when the lights in the real studio are dimmed, the

lights in the virtual background dim as well.

The concept for ELSET was developed by Richard Kunicki, owner of the Hamburg video-production company VAP. His idea triggered the formation of a European consortium including the BBC, Daimler Benz, Siemens, Thomson, and Silicon Graphics.

One of ELSET's coolest features is its ability to transform real video images into new 3-D worlds. "You could shoot Notre Dame de Paris, analyze the images, build up a completely new virtual cathedral from this data, and even produce a live TV show in it," explains Jens Bley, one of the project's managers.

The consortium estimates that electronic set design will reduce production costs of studio shows by up to 30 percent. More importantly, it will open up new creative dimensions for TV set designers and program developers. — Aaron Koenig

► of legislation). We had a chance once and forever to keep the government out of our phone switches. As it stands, future J. Edgar Hoovers and Richard Nixons will have an open invitation to your phone calls — be they voice or data. Not to mention Oliver North. ■■■ Butt-head, the Sequel: Remember some months ago, when astronomer Carl Sagan threatened to sue Apple unless it changed the code name of a secret project called Sagan? Apple cheerfully complied by changing the name to "Butt-head Astronomer," a move that so infuriated Sagan he sued the company for libel. Well, the court has dismissed the case, thankfully, and with some wonderful conclusions as well: "One does not seriously attack the expertise of a scientist using the undefined phrase 'butt-head,'" wrote a judge in the US District Court, Central District of California. "Thus, the figurative language militates against implying an assertion of fact." ■■■ +1 (800) 768 2221: That's the number far-right, Traditional-Values-Coalition leader Reverend Lou Sheldon has set up as a direct line to ►

<Send> Dirty to Me

Some people surf the Net, others cruise it. Whether you're looking for a quick lay in the chat room of a sex board, or stumbling upon the passion of a lifetime over a discussion of *Ulysses* in the books conference, there's an etiquette to dialing in and getting off. Although men and women may forever debate their differing needs in the messy, sweaty, outside world, what the sexes desire when they enter the purely cerebral world of ASCII text is pretty similar. I asked a few virtual bedroom visitors to describe what makes a memorable online lover.

— Mary Elizabeth Williams

What Women Want

I want someone who can come up with the filthiest thing that I could not have imagined myself.

He has to remember that "Oh, yeah" gets old after a while.

You have to find someone who is into the same sort of fantasy as you are. This is all fantasy, so it can be great to explore something with a person who is as hot about it as you are.

I love to be surprised. If the best you can come up with is, "Hey, you're a woman — wanna talk?" Forget it, I'm not interested. I can't see your body, so dazzle me with your brain.

I tend to get involved in dominant/submissive relationships even online, so really bland inexperienced college boys turn me off...

I have been involved with one wonderful, sweet man for almost a year now. I am as much in love with him as one can be with a human being she's never seen or touched. He makes me smile. He makes me laugh. He makes me think and ask questions. I want him. And I'll probably never have him.

Typing is a lot like real sex — nimble, accurate fingers make all the difference. You don't want someone who's going to confuse your vulva with your uvula.

What Men Want

What I look for online is interest, intelligence, enthusiasm, and a degree of perversion that is similar to, but not necessarily the same as, mine.

In real life, I can be kind of overt. But online, I'm usually rather subtle. I like to let the prospective talkee initiate things.

I like a woman who can write like she's wearing a garter belt and stilettos, even if she isn't.

The whole idea of fantasy is that the more out of touch with reality it is, the more workable it becomes. The further you go the better.

Imagination and willingness to play are essentials.

What it really takes is writing ability. Be a decent prose stylist, able to use words alone to take a partner to a different place. Know just when to be delicate and evocative, and when to be down-and-dirty crude.

The Transom

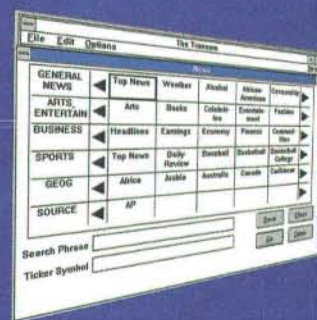
"It's an online service specifically targeted at the people who channel flip from MTV to CNN." That's how 26-year old ex-Spy staffer Michael Collins describes his start-up online service, The Transom, which launched in late August. Transom is the first online service specifically geared to 18- to 34-year-olds. Hip editorial content will be provided by accomplished young writers, aged 24 to 28, whose collective credits include The Washington Post, Spy, The New York Times, and Wired. Contributors to The Transom will write political satire and social commentary, as well as covering current affairs, and technology.

In addition to its editorial coups, The Transom offers live chat, Internet access, bulletin boards and regularly updated news feeds. One cool option is the NewsGrid, in which the user chooses from a matrix of topics to format his or her own personalized "news show." NewsGrid alone is reason to keep logging on.

Access to The Transom costs US\$5.95 per hour, or \$6.95 a month for five hours; with new users getting five free hours, this must be one of the best on-line deals around.

Free start-up software is available by calling (800) 475 9689, +1 (212) 274 0444, or sending e-mail to transom@reach.com.

— Katrina Holden



Smart Paper

Xerox's new self-clocking glyph codes, branded as DataGlyph technology, enable data to flow from the paper world back into the computer world as easily as they flow out.

A glyph is a tiny line, which stands for a 0 or a 1, depending on whether it slants 45 degrees to the left or the right. A patch of glyphs appears to the human eye as an unobtrusive gray pattern. It can be easily integrated into borders, shading patterns, and graphic elements without destroying the look and

utility of ordinary paper documents. Glyph codes can be read even if the glyph area has been crumpled, photocopied, stapled, faxed, or scribbled on.

Most importantly, no special equipment beyond standard printers and scanners is needed to use glyphs. Using a 300 dpi laser printer, you could fit the Gettysburg address in a 1.5-inch square.

Some suggested uses for glyph codes: encoding formulas for spreadsheets in the spreadsheet's borders; including demographic or

other recipient data in direct-mail pieces and marketing coupons; including information relevant to document structure and revision history; and imprinting a résumé onto a business card.

Xerox is working with a number of software vendors to bring glyph codes to the public within the next six months to a year. Given their potential utility and easy use, it would not be surprising if Xerox's embedded glyph codes became as familiar as, say, the photocopier. — Jordan Gruber



TIRED

Riot Grrrls
Pneumonic plague
SNL
Dan Rostenkowski
NiCad
Becoming a billionaire
Web pages w/forms
Upgrading
Information Superhighway
E-mail
Have and have-nots
Let's Go
alt.wired
RISC
NCSA Mosaic
Manhattan, NY
Redial Button



WIRED

Cyber Chix
Ebola Virus
Limboland
Marion Barry
Lithium Ion
Becoming a millionaire
Web pages w/telerobots
Overclocking
Global Information Organism
Human e-mail assistants
Linked and linked-nots
Rough Guide
alt.wired.tired.wired
VLIW
Netscape
Manhattan, MT
*69

► the Capitol. Seems the Reverend wanted his anti-gay minions to use the toll-free line to express their hate mongering — but, hey, anyone can call the number and get connected to his or her representatives. We tried it; it really works.

And it's free! Why not call up the Senate today and express your views, and let the ol' Reverend pick up the tab for you? You might even toss in a few choice lines on the Digital Telephony Bill, while you're at it. ☺ Microsoft Book

Notes: Bill Gates and his co-authors are learning just how tough it is to write a book. Or, rather, Bill Gates, Microsoft

tech wizard Nathan Myhrvold, and a writer called in to help them make a book out of their thoughts on the infobahn are learning how tough it is to work with publishers. Rumor has it they turned in a manuscript but the publisher (Viking) thought only five chapters were ready for prime time. So *The Road Ahead*, originally slated as a Christmas book, will not be out at least until March. Meanwhile, Microsoft's much-publicized but still nonexistent next-level operating system (once called Chicago, now named Windows 95) does have a book out, amazingly enough. It's called *Inside Windows 95*, and it "provides

Hot-Wired Braille Reader

Even though computer voice synthesizers talk faster than blind people can read Braille and are far cheaper than Braille displays, there is still a need for Braille displays. Reading allows better understanding of context and keener concentration, especially with complicated documents such as programming code.

Unfortunately, the best Braille displays for computers don't give blind people the sense of scanning a whole page, because they're based on a single row of pins moving up and down to represent letters.

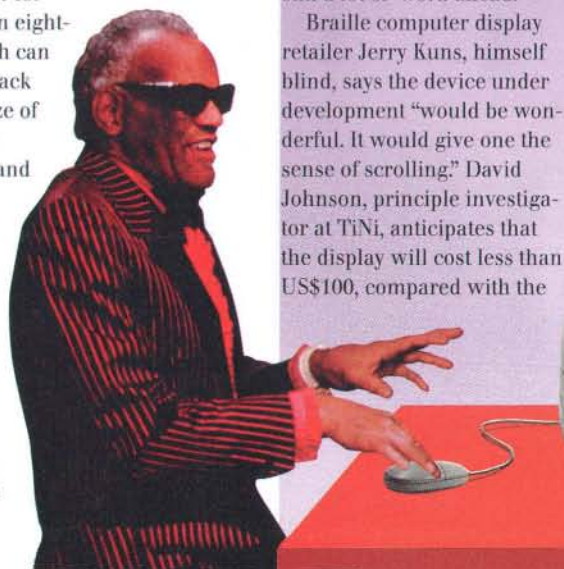
But TiNi Alloy Company of San Leandro, California, under contract

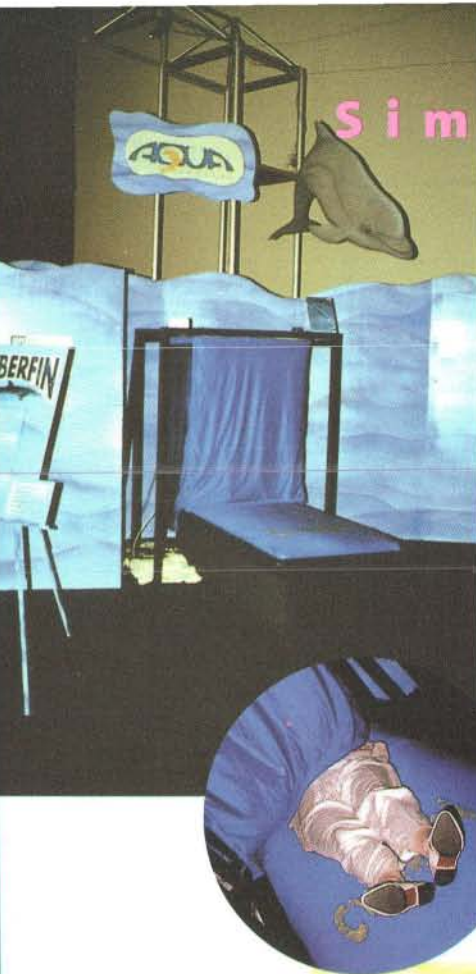
from the US Department of Education, has developed a working prototype of a new computer reader for blind people. TiNi mounted an eight-key display on a mouse, which can be moved up and down and back and forth across a base the size of a page. The keys, powered by Nitinol wires, flip quickly up and down to form Braille letters. Nitinol has a temperature-dependent memory: it takes one shape when heated and another when cooled. In the Braille reader, electricity will heat the wires. A consumer model will not be available for several years, according to Michael Bokaie, an engineer at TiNi, who says

that while the prototype proves the concept, there's still a lot of work ahead.

Braille computer display retailer Jerry Kuns, himself blind, says the device under development "would be wonderful. It would give one the sense of scrolling." David Johnson, principle investigator at TiNi, anticipates that the display will cost less than US\$100, compared with the

thousands for current one-line displays. TiNi Alloy Company: +1 (510) 483 9676, e-mail tini1@holonet.net. — Dave Cravotta





Sim Swim

David Cole, a VR developer and human-dolphin relations enthusiast, wants everyone to play with dolphins. But most people will never make it to the areas in Florida, Mexico, and the Bahamas where human-dolphin swim facilities exist. So he and his friends (who call themselves a band of "hard-rocking neuroscientists") have developed an elegant way of bringing the dolphin-swim experience to people everywhere.

Cyberfin, a dolphin encounter simulator, isn't the standard "kill-anything-that-moves" VR we've all grown so bored with. No clunky head-mounts, uncomfortable chairs, or motion-sickness headaches – Cyberfin qualifies as the first VR that's at least as comfortable as it is enticing. Lie back, on a heated "vibrasonic table," floating on a sea of liquid-crystal transducers that feels like something between a waterbed and a lava lamp. Add some ultrasonic transducers (nicknamed "neurophones") on the temples and conventional headphones with binaural sound, and Cyberfin can express what sound "feels" like to a dolphin.

Dolphins can stun prey with powerful sonic blasts; they can even recognize the signature whistles of their friends. As with most sea creatures, the ear has been emphasized over the eye. Cyberfin brings this refined ear to human beings: coupled with the vibrasonic table, dolphin clicks feel more like a massage than a message. Low-frequency sound waves pass through the body like an irresistible force, and – floating on a warm sea – you find it's easy to daydream that you're really playing with dolphins, somewhere off the Florida Keys.

When Cole displayed Cyberfin at SIGGRAPH in Orlando last summer, he found himself inundated with serious requests for Cyberfin installations from across the world; soon the Cancun Convention Center in Mexico will sport six Cyberfin simulators. Others should be appearing on the West Coast before Yuletide. Cyberfin probably won't be hard to find – one well-known proprietor of a chain of VR arcades was heard to exclaim, "We can charge more than five bucks for this!" – *Mark D. Pesce*

an overview of every new feature of the Windows operating system – including the base system architecture, the file system, and the new user interface." Has the publisher (Microsoft Press) shown this to the sleep-deprived coders over at Building 8 yet? Maybe they could read it and finally get the product shipped. **III Really Driving on the I-bahn:** A Seattle Volvo dealership opened up a WWW site (<http://www.dealernet.com>), and serendipity prevailed. While the Web isn't the greatest place in the world for selling cars, the page has turned up quite a nice parts business. **III Survey Says:** A global survey of consumer demand for interactive services came up with some interesting conclusions. Conducted by multimedia research firm Inteco (+1 (203) 866 4400), the survey found that households are cancelling their premium movie channels and curling up with a good CD-ROM instead. In fact, home PC ▶

Illuminating Geek Jokes

Q: How many Windows programmers does it take to change a light bulb?

A: Four hundred and seventy-two. One to write WinGetLightBulbHandle, one to write WinQueryStatusLightBulb, one to write WinGetLightSwitchHandle....

Q: How many WordPerfect support technicians does it take to change a light bulb?

A: We have an exact copy of the light bulb here, and it seems to be working fine. Can you tell me what kind of system you have? OK. Now, exactly how dark is it? OK, there could be four or five things wrong.... Have you tried the light switch?

Q: How many managers does it take to change a light bulb?

A: We've formed a task force to study the problem of why light bulbs burn out, and to figure out what, exactly, we as supervisors can do to make the bulbs work smarter, not harder.

Q: How many testers does it take to change a light bulb?

A: We just noticed the room was dark; we don't actually fix the problem.

Q: How many Microsoft technicians does it take to change a light bulb?

A: Three. Two holding the ladder, and one to screw the bulb into the faucet.

Q: How many MIS guys does it take to change a light bulb?

A: MIS has received your request concerning your hardware problem and has assigned you request service number 39,712. Please use this number for any future references to this light-bulb issue.

Q: How many C++ programmers does it take to change a light bulb?

A: You're still thinking procedurally. A properly designed light-bulb object would inherit a change method from a generic light-bulb class, so all you'd have to do is send a light-bulb-change message.

Q: How many developers does it take to change a light bulb?

A: The light bulb works fine on the system in my office....

Q: How many shipping department personnel does it take to change a light bulb?

A: We can change the light bulb in seven to ten working days, but if you call before 2 p.m., and pay an extra \$15, we can get the bulb changed overnight.

Q: How many Microsoft engineers does it take to change a light bulb?

A: None. Bill Gates will just redefine Darkness™ as the new industry standard.

Q: How long does it take a DEC repairman to change a light bulb?

A: It depends on how many burnt-out bulbs he brought with him.

Q: How many Newton users does it take to change a light bulb?

A: Foux! there to eat lemons, axe gravy soup.

Q: How many Microsoft vice presidents does it take to change a light bulb?

A: Eight. One to work the light bulb, and seven to make sure Microsoft gets US\$2 for every light bulb ever changed anywhere in the world.

– *Circulating Net meme*

Not long ago, Marianne Descalzo was terrified of heights. "I used to freak out or feel frozen," she says. "I avoided everything." Today she rides Ferris wheels and climbs on her roof.

The difference? Virtual reality. As part of an experimental treatment program at the Kaiser-Permanente Medical Group in San Rafael, California, Descalzo and 33 other acrophobic patients donned head-mounted displays and encountered a virtual elevated patio, as well as hills, a bridge over water, and a plank extending from the patio. The patients were asked to walk onto the plank and look down, and as the patient's reactions were real, challenges may have been virtual, but Heart rates and blood pressures increased, says Ralph Lamson, PhD, who led the study. After the treatment, 90 percent of the patients achieved self-assigned goals in the real world, such as ascending in a glass elevator.

Lamson is planning additional studies. One project would involve acrophobia and other anxiety disorder conditions. Ralph Lamson: +1 (415) 444 3036. — John Markes



Vertigo Reality



In the basement-like LunaPark nightclub in the heart of West Hollywood, HBO's Dana Gould, *Saturday Night Live*'s Julia Sweeney, *Reality Bites*' Janeane Garofalo, and *All American Girl*'s Margaret Cho are holding court with the Un-Cabaret, a live comedy show featuring material too quirky for the mainstream. Un-Cabaret is a place where comics can work out edgy routines: stories about nervous breakdowns, weird sexual habits, and those bizarre Mentos commercials.

Un-Cabaret's live audience is small – the usual 100 or so that can fill a basement club. But on the World Wide Web, websters are tuning into the online version at a rate of 7,000 logins a day. Accessed through the Web's "Underground Net" page (<http://underground.net>), the program features weekly updated video excerpts from performances at the comedy venue.

Un-Cabaret went online July 4, after Charles Como, 29, a former stockbroker and closet computer maven, approached Un-Cabaret showcase's

producers Greg Miller and Beth Lapid about programming for his fledgling Web page.

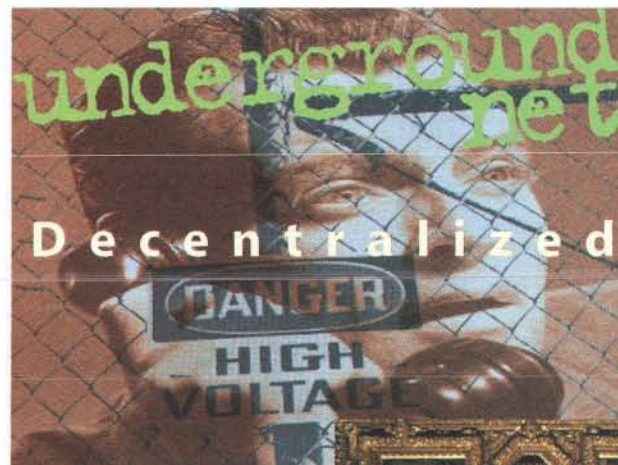
"It was a new idea to put a weekly show on the Internet," says Como. "The response has been tremendous. I've actually overheard people in restaurants talking about it."

Initially conceiving the site as an outlet for alternative expression, Como,

Comedy

who has been supporting the venture out-of-pocket, is now looking for corporate sponsors to facilitate expansion.

Un-Cabaret's comics were quickly sold on the idea. "Charlie brought his PowerBook to the club and punched up my set from the week before," says Gould. "It was the most Star Trekkie thing I ever saw in my life. It's a great match. The Internet can only be accessed by smart people – and Un-Cabaret is performed by smart people. That's our motto: 'Smart comedy for smart people.'" – Susan Karlin



► purchases are driven largely by entertainment and education rather than work-at-home applications. ≡ Fun fact for the month: *Mortal Kombat II*, the even bloodier sequel to the controversial rip-off-the-skull-and-see-the-spine-dangle videogame, sold US\$50 million in its first week this past fall. That beats every hit movie's comparable receipts, from *Forrest Gump* to *The Lion King*. ≡ One more fun fact: The number of international phone calls made worldwide rose from 23 billion minutes' worth in 1988 to 43 billion minutes' worth in 1993, according to *BusinessWeek*. That's nearly 82,000 years' worth of one country talking to

another. A good sign? ≡ Who Are We?: A recent Internet-based survey turned up some not-so-surprising numbers on who is using the info highway. According to a summary of the survey, respondents "were predominately male (nearly 80 percent), white (again nearly 80 percent), and young (median age of 31 years). About 40 percent classified themselves as single and never-been-married. The median household income of the 310 US citizens who responded was between US\$40,000 and \$59,000 annually. More than 22 percent of these ►

J A R G O N W A T C H

Barney Page

Web page designed to capitalize on a current trend (such as Barney-bashing). "Have you seen the new O.J. Simpson Barney page?"

Render Wander

Walking around the building chatting to people while the progress bar of AfterEffects/Premiere/Infiniti-D makes its ponderous journey across the screen.

Pointcasting

Even more precise than narrowcasting. What you get when you can talk one-on-one with your clients.

Fast Tracking

In architecture, when a building's design and construction documents are finished just days ahead of the actual construction.

Flight Risk

Used to describe employees who are suspected of planning to leave a company or department soon.

IC/OOC

(abbreviations for "In Character/Out of Character") Used in MUDding or other online role playing when someone is moving in or out of character. "OOC: I have to leave soon."

See Through

An office building, built during the economic optimism of the late '80s, that remains unrented.

Nesting

What Jay Chiat accuses his employees of doing if they sit at the same table more than two days in a row.

Dual-Channeller

A person who gets all their information by channel-flipping between MTV and CNN.

A tip of the propeller beanie to: molsk, Mitchell Rasor, destry, Kevin Marks, Tony Mosa, Hugh Brackett, Ray Smith. – Gareth Branwyn



WIRED TOP 10

Best-selling Underground Comics

(Year-to-date, 10/1/94)

1. *Horny Biker Sluts* #8
2. *Zap Comix* #13
3. *GWAR #1: Skullhed Face!*
4. *Last Gasp Comix and Stories* #1
5. *Cherry* #13
6. *She-Male Trouble* #1
7. *AS-FIX-E-8*
8. *Tales of the Leather Nun*
9. *Gay Comix* #19
10. *Weirdo* #28

Source: Last Gasp, a comic and book publisher based in San Francisco, (800) 848 4277, +1 (415) 824 6636. — Gareth Branwyn

Ever felt clueless in the record store because you didn't know Jesus Lizard from Jesus Jones or — more importantly — didn't know whether either artist's CD was worth 15 bucks? Meet Ringo, a free Net-based "personal music recommendation service," which rates music based on your tastes.

When you send e-mail to Ringo, it replies with a list of musicians and groups for you to rate from 1 ("pass the earplugs") to 7 ("can't live without it"). Evaluating this info and data, culled from users with similar tastes, Ringo recommends artists and tells you whom to avoid.

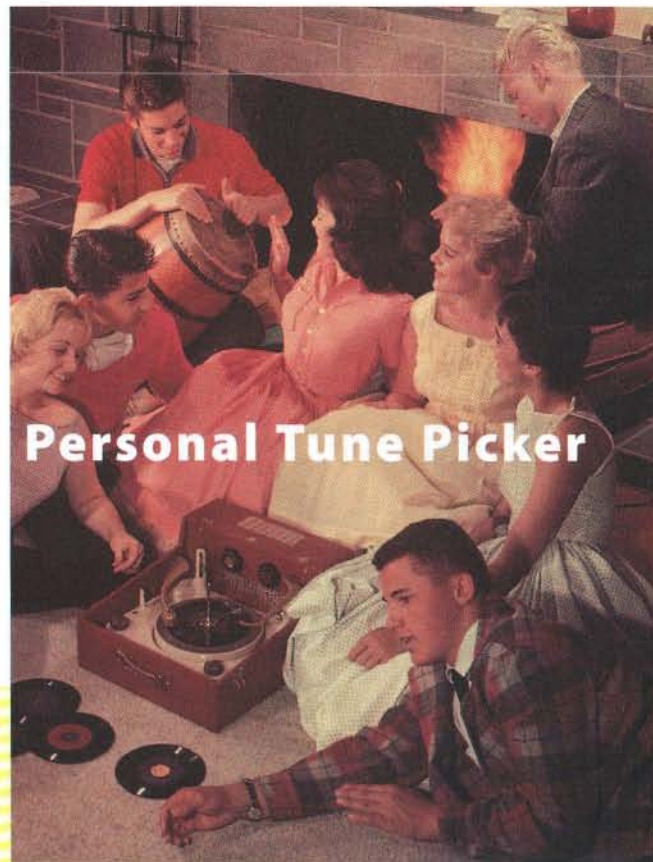
Part of an MIT master's thesis, Ringo improves as more users — 2,400 were using it by September — fill out surveys.

How accurate is Ringo? It recommended two of my favorite bands, Rodan and Big Black, but predicted that I'd score Tom Waits — whom I would give a 7 — with a way-off-the-mark 4.7. Still, that it suggested John Zorn bolstered my confidence about trying artists I'd never heard. To Ringo's credit, it hit several personal faves spot-on and may well improve with increased data.

To subscribe, e-mail ringo@media.mit.edu with only join in the body; you'll receive your first survey within an hour. Subsequent mailings include command overviews, answers to frequent questions, and newsletter/charts of Ringo's highest- and lowest-rated artists (Pixies and NKOTB, respectively, the day I joined).

And how do the two Jesi rate with the Ringo gang? Lizard: 6.8; Jones: 3.2. — Colin Berry

Ringo: Personal Tune Picker



respondents claimed an annual household income that exceeded \$80,000." As for politics: 36 percent Democrat, 32 percent independent and 23 percent Republican. III Internet Index, Version 3: More cool numbers from Win Treese's Internet Index — number of daily newspapers with Internet mail addresses, 54; number of TV and radio stations with Internet mail addresses, 62; average time between new network connections, 30 minutes; number of commercial domains registered between July 15 and August 15, 1,401; number of Internet access providers (US), more than 100; number of cable television companies providing Internet access, one. To subscribe to future issues of the Internet Index, send a message saying *subscribe internet-index* in the body to internet-index-request@OpenMarket.com. III

Reach Out and Sue Someone

There seems to be a pattern forming: utter a discouraging word about a corporation on a national online service, and you may be invited by an out-of-state judge for a friendly courtroom visit. To those who file suit, it's irrelevant whether or not the defendant ever set foot in the court's state. The deed was committed on the state's telephone lines, and that's enough.

In separate incidents, two participants in the Money Talks discussion area on Prodigy were hauled into out-of-state courts. Each allegedly damaged the stock value of a publicly traded medical-device company through badmouthing. Peter DeNigris of New York, was sued in New Jersey, by a New Jersey company called Medphone. A. Karl Kipke, a resident of

Kansas, was sued in Portland, Oregon, by a company there named Epitope.

You don't have to lurk on a big-time national service like Prodigy to be sued out of state, though. Recently, the owners of the Amateur Action computer bulletin board, in Milpitas, California, were convicted on obscenity charges in Tennessee. It was bad enough that they were forced to defend themselves from 2,000 miles away (over objections that the recently enacted NAFTA treaty protected against such remote jurisdiction), but Tennessee's relatively conservative local community standards were applied in deciding whether Amateur Action's online offerings were obscene. If other courts follow this precedent, small, conservative morality zones could dictate the legal availability of online information in

communities across the country.

Luckily, there is one court decision pointing the other way, limiting out-of-state jurisdiction on the infobahn. In *CompuServe v. Patterson*, CompuServe Incorporated sued Richard Patterson, a Texas resident, in federal court in Columbus, Ohio (CompuServe's backyard). Patterson, not entirely intrigued with the commute to Columbus, filed an early motion to dismiss the case for lack of jurisdiction, and — surprise! — it was granted by the court.

The judge recognized that the use of an online service with national coverage does not automatically make the user liable in lawsuits from every state of the union, saying: "It appears that the cus-

tomers primary interest is in the information contained on the network, much of which may come from other CompuServe users in states other than Ohio." The judge even declined to simply transfer the case to a Texas court with the proper jurisdiction, although federal courts have that option — it was more important to dismiss a case in Ohio against a guy who never even set foot there.

Will *CompuServe v. Patterson* mark the beginning of a trend limiting remote jurisdiction over netizens? Probably not. Local courts protect local citizenry and institutions, and many will continue to extend that protection against long-distance interlopers. This issue may not be put to rest until the big guns, the US Congress or the Supreme Court, finally step into the ring. — Lance Rose, esq.



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FORTUNE

MANAGING IN A WIRED WORLD

VOL. 130, NO. 1 JULY 11, 1994

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Color Me Cheap

Printers, like all electronic equipment, keep getting cheaper and better, but Epson has set a new standard with its first inkjet color printer. The Stylus Color gives you near-photorealistic output at 720 dpi. I used to go to the local service bureau and shell out US\$12 per page for Canon color copier prints. This printer is going to pay for itself in no time flat.

Stylus Color: US\$699. ▶

Epson America Inc.:

(800) 289 3776,

+1 (310) 782 0770.

Biomusic

Wire yourself to the WaveRider jr. – via electrodes and conductive jelly – and let your body make music. This small electronic device, in conjunction with a Mac or PC, converts your body's biosignals into musical notes, allowing you to play your heart like a drum, your brain like a piano, and your arm muscles like a trombone. You can designate notes, ranges, scales, and keys or create your own custom setups. The Pro, MAX, and MAX Pro ▶

versions of the WaveRider give you more channels and lots of extra goodies, allowing the ultra intense to write their own biosignal-to-MIDI output algorithms. WaveRider jr.: US\$750, MAX jr.: \$1,250, Pro: \$1,500, MAX Pro: \$2,000. WaveAccess: +1 (510) 526 5881.



F E T I S H



Edited by David Jacobs



◀ All-Around Sound

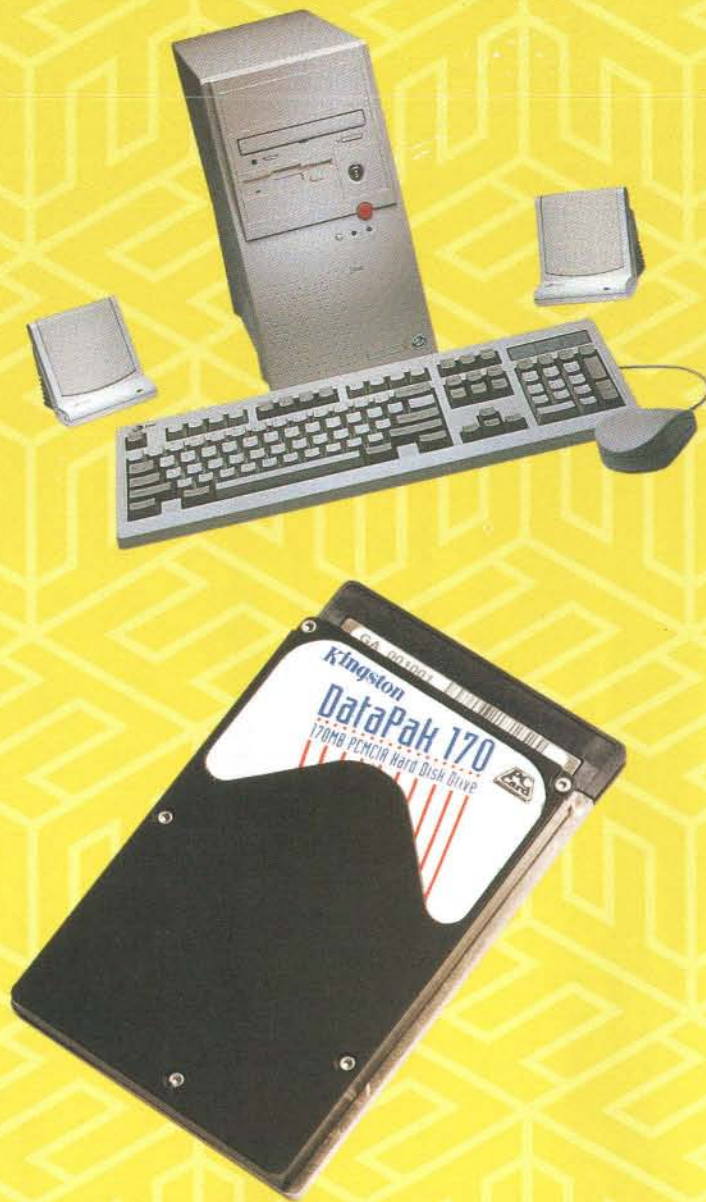
For the ultimate power presentation, strap these 3-D headsets on your victims and they'll believe everything they hear. The wireless Imax PSE headset has three infrared receivers so it can deliver ultra-realistic 3-D sound no matter where the head is turned. Designed for use in Imax theaters, exhibit narrations, and simulator rides, the PSE headset can also be fitted with liquid-crystal shutter glasses for advanced 3-D visuals. Sonics's engineers will custom design and build a sound system based on your specifications. PSE Headset: US\$250-\$390. Sonics Associates Inc.: +1 (205) 733 0500, fax +1 (205) 733 0569.

◀ Kill Migranes

Aspirin and other over-the-counter painkillers are about as effective as Flintstones Vitamins when it comes to treating migraines, a severe form of headache that afflicts about 20 million people in the United States. The Imitrex SELF-dose is a syringe cartridge containing sumatriptan succinate, a substance that wipes out even the worst head-pounders. The cartridge fits into a spring-loaded holder for easy self-injection. Imitrex SELF-dose unit: Approximately US\$45 per dose. Glaxo Inc.: (800) 545 2965, +1 (919) 248 7900.

Hard Card

Your hard-disk drive is one of the few computer peripherals that use precision moving parts. It's hard to believe they made one tiny enough to fit in a PCMCIA card, but they did. Even more impressive is the performance of The DataPak, a 170-Mbyte, extremely rugged PCMCIA disk drive. It draws barely more than a watt of power when in use, and with a transfer rate of 3.5 Mbytes per second, it's perfect for swapping large amounts of data between computers with PCMCIA slots. Since you can simply pull the drive out of the slot, security is hardly an issue. The only thing you'll have to worry about is losing the little guy. DataPak 170: US\$565. Kingston Technology Corporation: (800) 835 6575, +1 (714) 435 2600. ▶



Nextwork

The next generation of network access for the Macintosh is now here. The DaynaLINK for ARA, a mobile access server, uses PCMCIA card modems to support up to eight remote clients via an AppleTalk connection. The RISC processor and Dayna's software provide enough power to handle high-speed data transfers for all eight remote users at the same time. DaynaLINK for ARA: US\$2,999. Dayna Communications Inc.: +1 (801) 269 7200. ▶



◀ Multitasking Mania

AT&T's new Globalyst 360TPC personal computer is the perfect toy for the attention-deficit-disorder set. Now you can take a conference call, play your favorite CD, open a spreadsheet, download a file, direct incoming calls to voice-mail, and send a fax, all without having to get up from your desk. The Globalyst, with an Intel 486 DX2/66 processor and 420 Mbyte hard drive, does it all. If you are looking for a one-stop solution for all your data needs, this is it. Globalyst 360TPC: US\$2,199 with monitor. AT&T Global Information Solutions: (800) 637 2600, +1 (513) 445 5000.

Merge with Your Mouse

If Linus had one of these mice, he'd throw his blanket in the trash. The heart-shaped Sensa mouse from Logitech cries out to be caressed. Its consumer-tested soft edges and indentations for the thumb and fingers make it fit so comfortably in your hand it becomes a part of you. Sensa's three-button design and software (included) is crafted to prevent stressful repetitive motions, such as ▶ double clicking. You can get one in your choice of four groovy patterns: deep wood, black chess, silver pearl, or blue leopard (shown here). MouseMan Sensa: US\$74.95. Logitech: +1 (510) 795 8500.

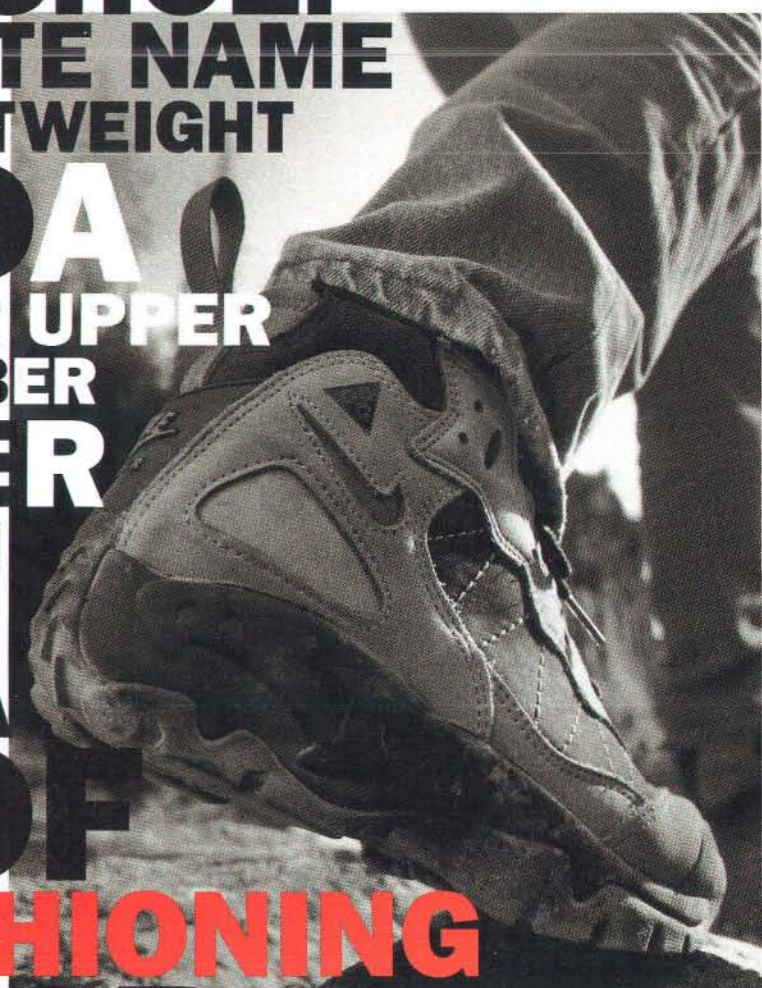
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WOULD BE THE LIGHTWEIGHT

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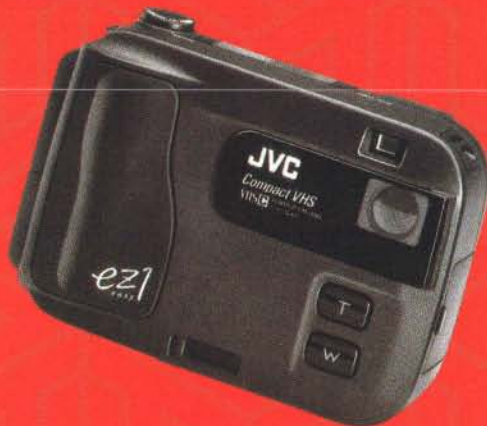
ACG MEANS ALL CONDITIONS GEAR AND ALL CONDITIONS MEANS **ALL CONDITIONS.**

Dial and Swipe

PhonePlus is smart enough to know you can send more than a conversation over the line. The built-in keyboard and digital display are handy for taking notes and entering names and numbers into the speed-dial database. As a phone, it's top-notch, with one-touch autodialing, call forwarding, return calling, and three-way calling. But here's the most interesting feature - PhonePlus reads the magnetic strips on bank cards, with custom software to enable shopping, ATM transactions, bill paying, and fund transfers from home. If QVC's smart, it'll give this thing away. PhonePlus: US\$199. Verifone: +1 (703) 834 9480.

Make Your Point

The next time you make a presentation using your PC, don't let the mouse keep you tethered to a table top. Get up and move around with the RemotePoint, a cordless, hand-held, infrared pointing device that controls your Mac or PC up to 40 feet away. And an onboard transducer converts variations in thumb pressure into cursor movement. No special software is needed: just plug it into your PC port and begin pointing. RemotePoint: US\$199. Interlink Electronics: +1 (805) 484 1331, fax +1 (805) 484 8989.



◀ No-Brainer Camcorder

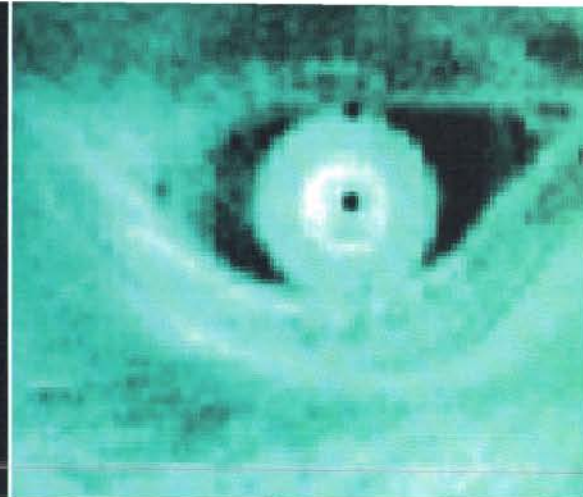
While one of the distinguishing characteristics of techno-fetishists is an obsession with buttons, knobs, and levers, sometimes I just want to sit back and let the machine make the decisions. That's when I reach for the EZ1, a compact VHS camcorder from JVC. It looks like a point-and-shoot still camera and works a lot like one too. All I have to do is look through the viewfinder and press the "shutter" button. There are a lot of nice idiot-proof features buried in the software too, such as Instant ReShoot, 3x Power Zoom, and QwikPix, which lets me take a series of 5-second-long shots. GR-EZ1 camcorder: US\$699. JVC Company of America: (800) 252 5722, +1 (201) 808 2100.

◀ Time Chip for Couch Potatoes

The blinking 12:00 on VCRs is standard fodder for bad stand-up comedy. Now PBS is making life a little easier for confused couch potatoes. In June, the network began invisibly transmitting a time signal that can be picked up by VCRs equipped with a special chip. The Sony SLV-770HF is the first VCR to come with the chip, which continuously resets the clock. SLV-770HF: US\$599. Sony Electronics Inc.: (800) 222 7669, +1 (201) 930 1000.



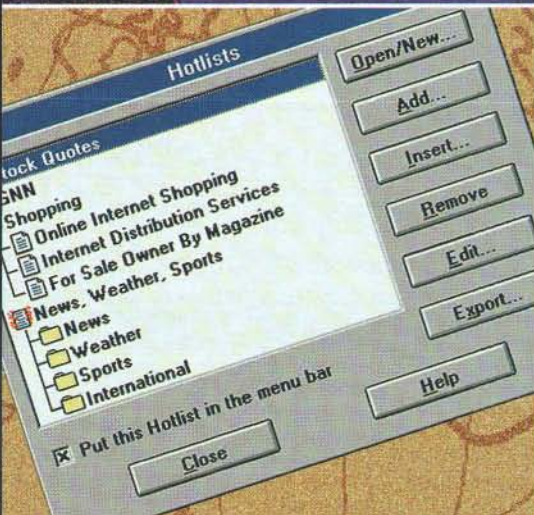
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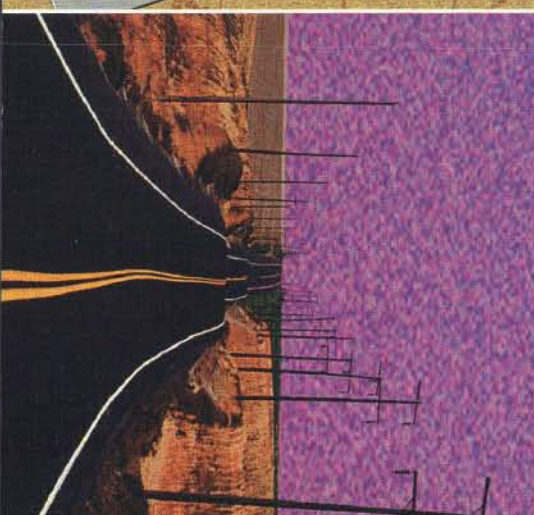


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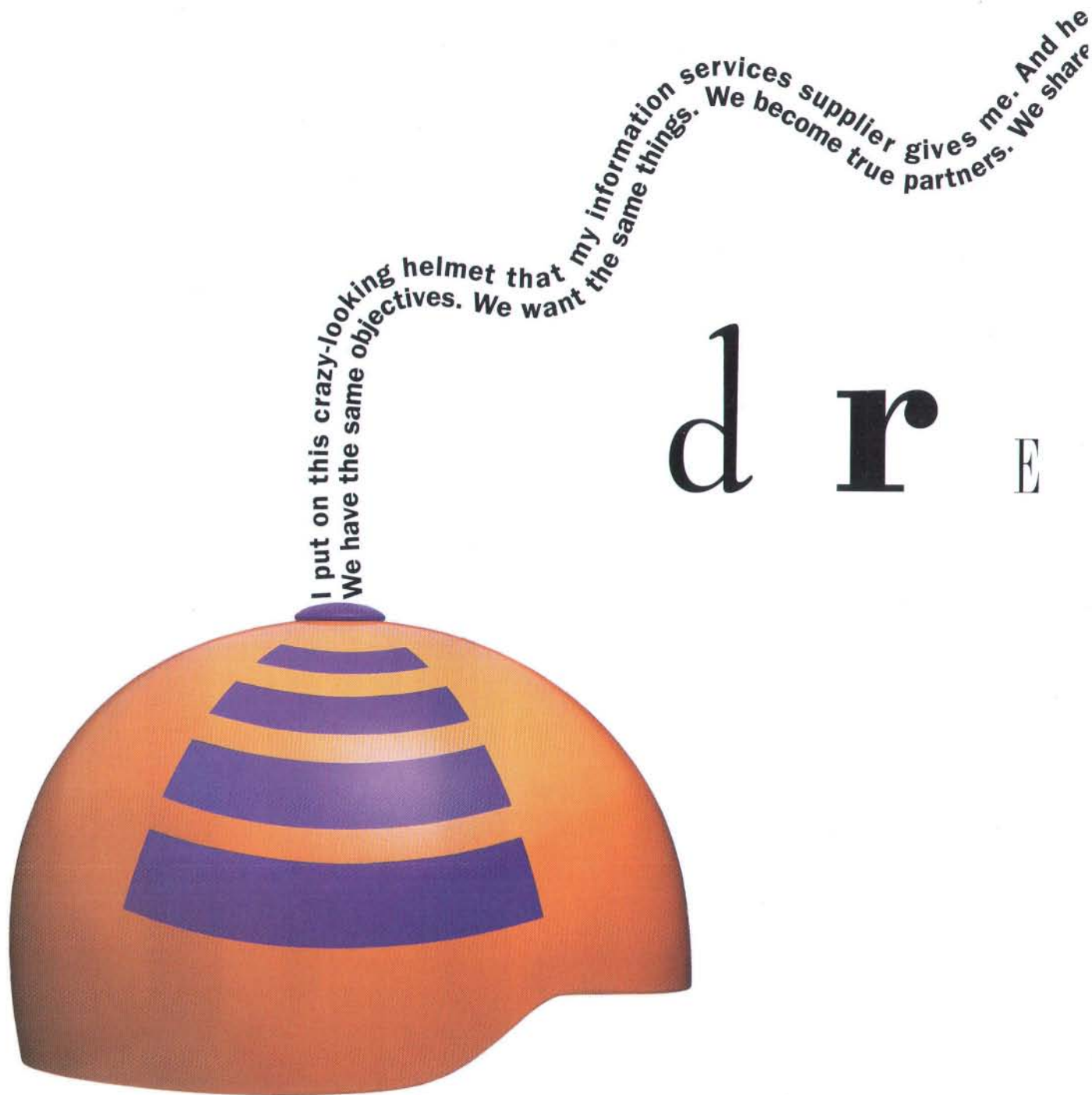
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A m

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compete more effectively, we're confident we can help you, too. For more information, call (510) 426-6171.



The Future of CDs



You've heard the hype. We asked the experts. Here's the real timetable.

In 1967, the digital recorder was introduced in Japan – 77 years after the first recording studio opened in New York City. In the following years, artists, producers, and the entire music industry were swept up in a language

of zeros and ones that revolutionized the creation and distribution of recorded works. *Wired* asked five experts in the field about the future of digital recording technology. – David Pescovitz

	Custom CDs on Demand	Digital Studio Recording	Affordable Home CD Recorders	Online Shopping for CDs	Death of Audio CDs
Ivan Berger	1998	1997	1999	1997	2005
Roger Dressler	never	2005	never	2005	2020
Ron Gompertz	1996	2010	1997	1995	2010
Peter Gotcher	1995	1997	1996	1999	2005
Jerry Harrison	1996	never	1997	1996	2010
Bottom Line	1996	2002	1997	1998	2010

Ivan Berger
technical editor,
Audio magazine

Dressler believes in-store kiosks that press custom CDs cannot offer "real CDs as consumers know and love them today" because the compression schemes that must be used degrade the audio quality. According to Harrison, the greatest use for the CD-on-demand technology will be for new albums and artists with unpredictable sales potential and for "difficult-to-find" albums, which at present would not be profitable to release on CD."

Gotcher points out that while the transition toward disc-based systems is gaining momentum, "tape has deep roots in this market." Gompertz adds that digital software and hardware are prone to crashes, and analog tape is still the way to go. Harrison agrees that the specific sonic qualities and low price of analog tape – and the large amounts of nonlinear digital storage space needed for audio – will keep magnetic tape in the recording loop except perhaps in the worlds of film and advertising.

While these can be had now for around US\$2,500, Harrison thinks they will face the same controversy as home Digital Audio Tape recording, "the problems with protecting copyrights." Berger predicts that 5-inch CD recorders will first become popular among home-computer users to create CD-ROMs, and as the hardware sales increase, the recorders will drop in price enough to break into the home-audio market.

Gotcher believes that "alternative music" distribution could be revolutionized by this technology." But he points out that the integral part of this technology is getting consumers "wired" with the high bandwidth necessary to download music at a reasonable rate. Harrison says the quality of compressed audio retrieval "will not be as good as buying the real thing," and after considering the price of the service provider and the recorder, the cost of downloaded recordings "may not be less than normal purchases."

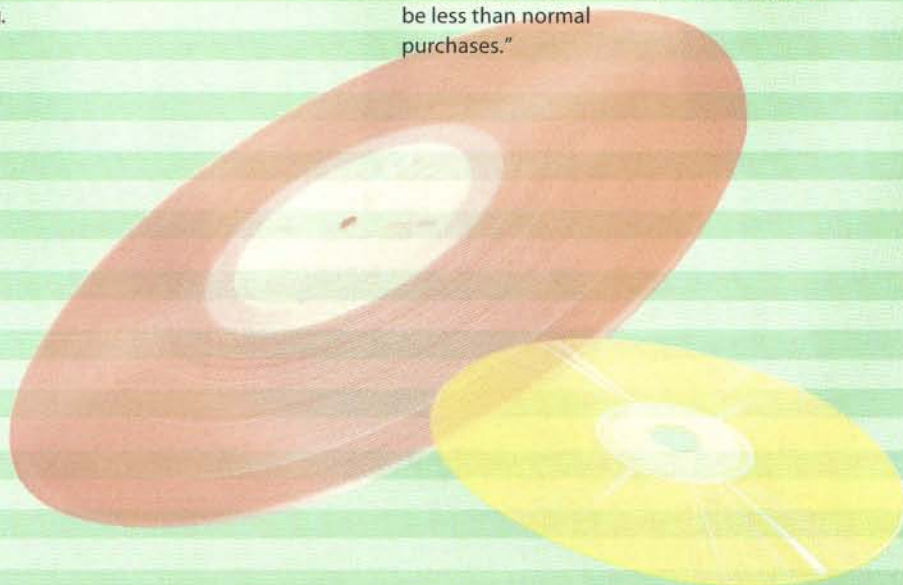
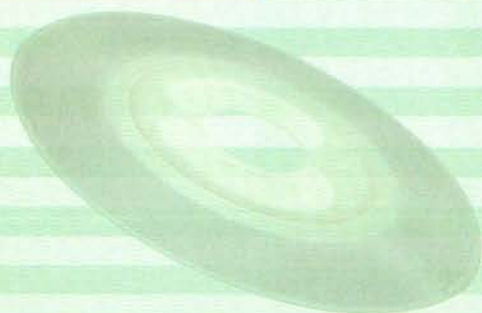
Gotcher predicts that the CD-ROM format may stick around for a while but that electronics and record companies could "push a next-generation technology with greater revenue potential." Dressler speculates that in 25 years "data densities in memory cards will be high enough and cheap enough to popularize solid-state storage in mass-market audio systems," a concept similar to the flash ROMs Harrison thinks will become the format of choice for portable players.

Roger Dressler
technical director,
Dolby Laboratories
Licensing Corporation

Ron Gompertz
president, Heyday
Records, co-creator
of *Cyborgasm* and
The Edge of the Bed:
Cyborgasm 2

Peter Gotcher
president and CEO,
Digidesign Inc.

Jerry Harrison
audio producer and
member of the now-
defunct Talking Heads



Our cranberry vodka is red

because it has
cranberries in it.

We
could've
just used
clear
artificial
cranberry
flavoring.
But then
our vodka
would be
pale and
spiritually
void.



Finlandia
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vodka from the top
of the world.

(Like your boss.)

USING MEDIA

The average US resident spent 1,529 hours in front of the TV this year and another 1,082 hours listening to the radio. True, these figures dwarf the time we spend reading print media. Yet books and magazines remain more popular than the movies and videogames that pundits predict will be the mainstay of the I-way.

GETTING WIRED

Growth in the number of US households that own PCs has begun to slow, but more households are buying peripherals such as CD-ROM drives. It's unclear how many of these devices are really being used. For example, modem sales are booming, but most customers discontinue their subscriptions after being online just a few times.

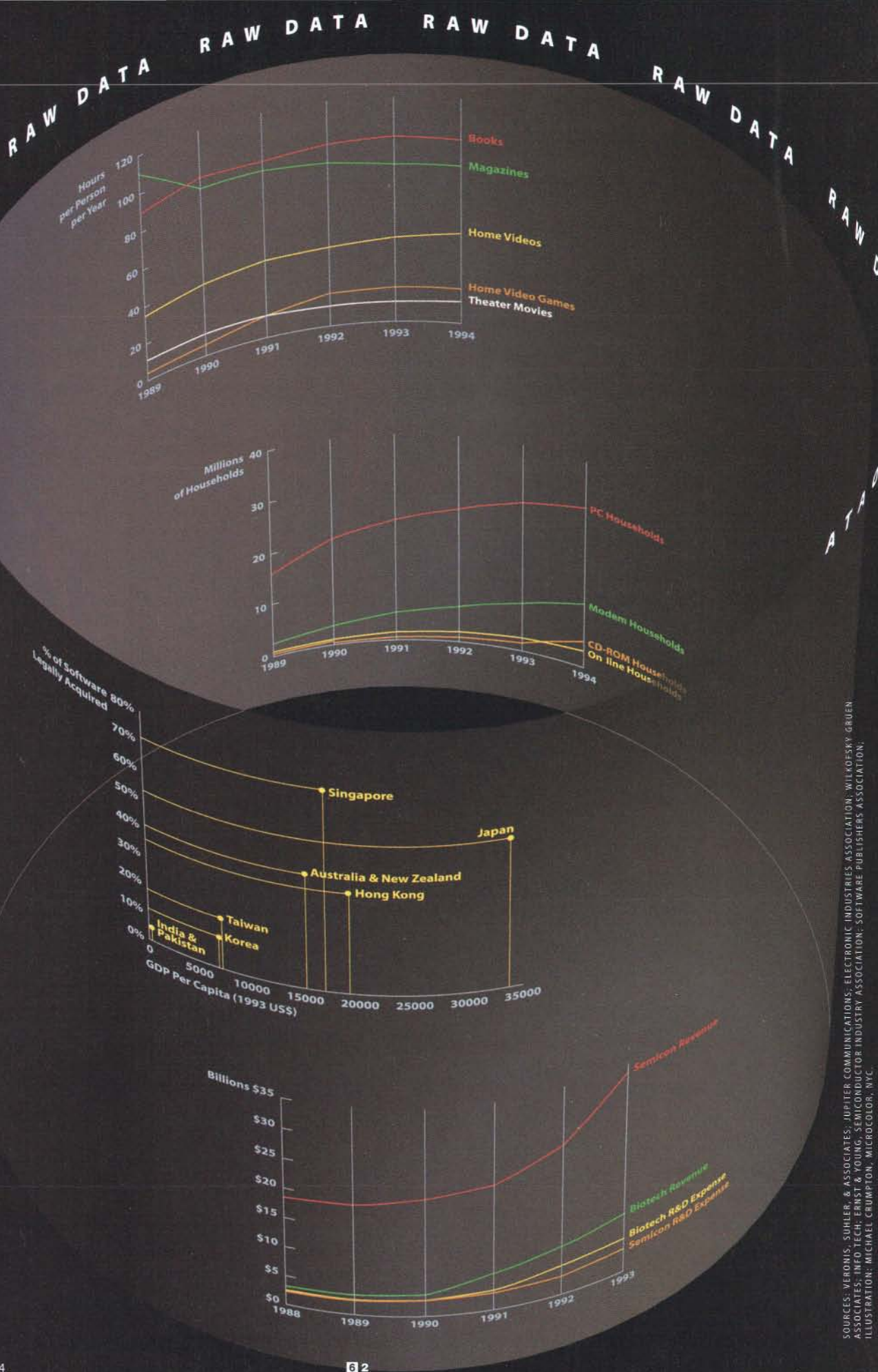
SOFTWARE PIRACY

Last year, US\$7.4 billion of software was pirated worldwide. Cultural attitudes seem more likely to determine which countries are most apt to illegally duplicate computer programs. In law-abiding Singapore, 71 percent of software is legally purchased, while in wealthier but more free-wheeling Hong Kong, only 36 percent of software is legit.

BIOTECH VERSUS SEMICONDUCTORS

Clear parallels mark the US biotechnology and semiconductor industries. But biotechnology remains significantly less profitable, largely because of the incredible amount of research that is required for each product.

— Steve G. Steinberg



SOURCES: VERONIS, SUHLER, & ASSOCIATES; JUPITER COMMUNICATIONS; ELECTRONIC INDUSTRIES ASSOCIATION; WIKOFFSKY & GRUEN ASSOCIATES; INFO TECH; ERNST & YOUNG; SEMICONDUCTOR INDUSTRY ASSOCIATION; SOFTWARE PUBLISHERS ASSOCIATION; ILLUSTRATION: MICHAEL CRUMPTON, MICROCOLOR, NYC.

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Welcome to OneTribe and OneWorld.

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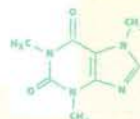
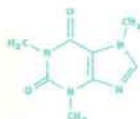
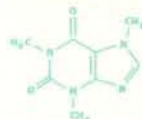
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Where I'm from ... Я из ...

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Australia	Австралии
avstralii	
Asia	Азии
azii	
Canada	Канады
kanadi	
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VLIW: Beyond RISC

The Next Revolution in Microprocessors

By Steve G. Steinberg

While the big microprocessor developers don't want to tip their hands, there have been hints that the next generation of processors will be radically different from RISC processors. Most likely, they will be based on another four-letter acronym: VLIW (Very Long Instruction Word). VLIW has been around since at least the early 1980s and is perhaps most notable for the number of companies it has left bankrupt. Yet Hewlett-Packard, working in cooperation with Intel, has hired Joseph Fisher and Bob Rau, the two stars of VLIW research, and, according to industry reports, IBM and Digital also appear to be racing toward this new technology.

Current performance rests on the fundamental equation of computer architecture: the time required for a program to run is equal to the number of instructions in the program, times the average number of cycles required for an instruction, times the clock cycle period. (A clock cycle is the heartbeat of a microprocessor: each pulse triggers one step of computation.) All improvements in performance come from reducing one or more of these factors. The idea behind CISC was to reduce the first factor – the number of instructions – by making a single instruction do complex tasks. The problem was that the other two factors of the equation shot up. This led to the RISC approach of short, simple instructions and a clock cycle fast enough to compensate for the increase in the number of instructions. This approach

works well, as far as it goes. But raw chip speed never increases by more than 25 percent a year, so additional performance must come from the growing number of transistors that fit on a single chip.

The first answer, emerging at the end of the 1980s, was superscalar RISC. A microprocessor is like a factory, made up of a dozen or so stations, each of which handles a single, simple task (for example, one station handles all additions). If a processor has two copies of all these stations, then it can work on any two instructions simultaneously. This solution had seductive appeal: simply double the number of stations and you get twice the performance.

It wasn't that easy. An instruction that adds two numbers may be followed by an instruction that uses the result. The second instruction cannot be executed until the first has been completed. Superscalar processors must detect these dependencies and ensure that only independent instructions are executed simultaneously. And this results in the key problem facing designers: the more instructions you try to execute simultaneously, the more dependencies you have to check for at every cycle, and therefore the longer your cycle time. So designers are faced with a trade-off between the Digital approach, whose AXP21064a Alpha processor runs at 275 MHz but has a maximum of only two simultaneous instructions, and the IBM approach, whose POWER2 plods along at 71.5 MHz but can execute up to six simultaneous instructions.

VLIW avoids this crippling trade-off – it can do simultaneous instruction sets at a high processing speed. That's why so much money is now being thrown into its development. VLIW follows a maxim popular in the hardware community: move the difficult stuff out of the hardware and into the software. Rather than having the microprocessor figure out on the fly which instructions are independent, have the compiler – the tool that translates a high-level program into machine instructions – figure it out beforehand.

So a compiler for a hypothetical 16-way VLIW processor first converts a program from a language like C or Fortran into standard RISC machine instructions. It then goes through the RISC instructions and sticks 16 of them together to produce one very long instruction. The compiler is able to determine when dependent instructions can be executed because it knows exactly how many cycles an instruction takes to produce its result. When the compiled program is run, the processor grabs each long instruction in a single gulp and, without wasting any time worrying about dependencies, immediately routes the 16 independent pieces to the appropriate stations. The VLIW processor itself is almost identical to a superscalar processor, but with the dependency-checking circuitry eliminated and the instruction word widened.

But, along with some significant design challenges, two major stumbling blocks remain. The first is that current compilers can rarely find more than four independent instructions

per cycle. Even Joseph Fisher, who coined the term VLIW, has said that VLIW really only achieves significant speed increases for more predictable scientific programs.

The second stumbling block is more subtle, and is as much a marketing issue as a design problem. We are accustomed to processors being downward compatible: if a program runs on a 25 MHz 386, it will also run on a 50 MHz 486. This is not true for VLIW processors. Remember that a VLIW compiler schedules instructions based on the precise number of cycles required for that instruction's execution. Run a program on a processor with a faster multiplier than it was compiled for and instructions could get out of order, causing nasty and unpredictable results. If you believe the hints coming out of Hewlett-Packard, it may be possible to preserve downward compatibility with hardware emulation, albeit with some sacrifice in performance.

It's going to take a little luck and a few hundred million dollars in R&D, but VLIW should allow computer performance to continue on its exponential growth curve for the next 5 to 10 years. It will achieve this by taking full advantage of chip speed with simple, streamlined hardware, and of chip transistor densities with many duplicate processing stations. But the most important result of VLIW may be the closer ties it is fostering between hardware and compiler researchers. It is a relationship that has never been as tight as it should be, and could lead to startling new developments. ■ ■ ■



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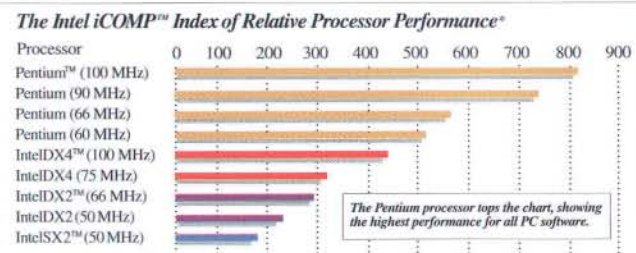




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Making Every Vote Count

A US software jockey helps create
the technical infrastructure

for the election of the century – in South Africa.



By Erik Nilsson

There wasn't enough time. Not just for building the computer systems, but for everything. The schedule was insane. It was as if we were trying to build a nationwide banking system in six weeks, in a huge, politically unstable country where terrorist bombings are routine. Open 9,000 branch offices all on the same day, run for four days, and then shut down – without losing anybody's

money.

Our task, in April 1994, was to help South Africa prepare for its first multiracial elections. The enormous responsibility of these elections would rest with the Independent Electoral Commission, where I would work on computer systems. As a soft-

guess how many people would show up at the polls? Just directing voters and workers to polling places was difficult with addresses as makeshift as the facilities themselves. (One polling site was officially called "the tent behind Bob's house.") Ballot boxes, polling equipment, entire counting stations, and millions of ballots had to be deployed in a country that encompassed sprawling urban leviathans as well as outposts a day's drive from a telephone. Worse, the elections had only been announced five months earlier. What would normally take a year to complete had to be done in 20 days.

To keep track of these mammoth, frenzied, and changing circumstances, South Africa would need massive databases to follow people, places, and equipment. And massive databases to record protests, incidents of violence, and the election results themselves. Software was needed to manage these databases, enter new information, and produce reports. The task would have been impossible without computers, but even with the technology we could still only hope we'd bought enough time. A common South African expression – "The wheels come off it," meaning something has become a fiasco – seemed to preface far too many conversations around the commission.

I arrived at Jan Smuts airport 20 days before counting started and drove to Johannesburg. April is autumn in South Africa – the rainy season is over, and the weather is pleasant. Like a street hustler, Jo'berg is friendly, threadbare, and menacing. The center of South Africa's mining region, Jo'berg is called the "City of Gold" because its modern, graceful towers were bought with precious ores from beneath the surrounding plateau. But depressed gold prices, a drought, and sanctions have taken their toll. The wealthy white suburbs are tidy and peaceful, but the city itself is run-down and dangerous. The streets reek of garbage and urine. Muggings are common after dark.

I didn't have much time to worry about Jo'berg's decline, however. After I checked into the hotel, I went over to the Independent Electoral Commission headquarters to get started. That's where I would work every day for the next 25 days, an average of 16 hours each, scattered around the clock in an irregular blur. I didn't go through jet lag, I just went to work.

The commission, headquartered in a 10-story building five blocks from our hotel, was a caricature of a busy



By including political party symbols and candidate's faces on ballots, the Independent Electoral Commission made it easier for many South Africans to vote.

ware jockey from the US, and a member of Computer Professionals for Social Responsibility (CPSR), I would be loaned to the South African Commission from the CPSR Computers and Elections project, which assists the US Federal Election commission with voting equipment standards, analyzes elections, and gives advice on election security. Fellow CPSR member Bob Wilcox and I have been running the project for seven years.

In March, I got a phone call from the International Foundation for Electoral Systems, which sends technical and other experts to "difficult" elections, often in the Third World. Were we interested in helping with software for the South African elections? Of course we were – how could we turn down the opportunity to work on the election of the century?

The challenge would be daunting. The South African electorate, newly swelled with the enfranchisement of the huge black majority, was estimated at 25 million, but there was no census to show where they lived. How would we tell people where to vote if we didn't even know where they were? How would we make sure we sent out enough ballots and election workers if we could only

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Sincerely,
Frank



 

to: Steve Fisher
from: Frank Shuford
about: meeting Mon. 12/5

 tap for details

*Kelly,
The plane's leaving
on-time (surprise,
surprise) I'll be
in at 5:00 to go
over your (terrific)
ideas. Let me know
if that's OK.*

Frank 


 

to: Kelly Tobin
from: Frank Shuford
about: Meeting

Dear Patrick,

Hey, I know you're tied up on that project, but you gotta come up for air sometime! Like maybe for the hockey game of the century—tonight, 8pm, two tix, center ice, on the glass? Get back to me, okay?

Frank

 pager

to: Patrick Vogt
from: Frank Shuford
about: Time-out



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office building. People were charging around and shouting at each other 24 hours a day. A constant stream of new faces and equipment poured into every office. People shared desks. People shared chairs. The phones were always ringing, the faxes faxing, the elevators jammed, and the air heavy with air-conditioned sweat. The commission didn't hum, it roared – sometimes painfully loud.

Applications were being written and deployed daily, if not hourly, including systems to track 200,000 elections employees, 9,000 polling locations, warehouses full of equipment, and the voting results themselves.

faxes and entered them into the database. Another program then totaled the results per party and passed these results to a transmission program that sent them to the world's news media. As the count progressed hour by hour, new election results would appear on millions of TV screens minutes after we had received them.

All of these programs for tabulation were written by a small software group inside the Election Administration Directorate. It was the dawn patrol of software. Beside me, there were two other Americans: forms whiz Mario Tejada and Michael Yard: ex-minister, ex-

grave situation. "Only one [commission] office was bombed today."

Eleven days before the count, and only a week before voting started, the commission was awash in rumors that the Inkatha Freedom Party, the Zulu political party of some two million voters, would now be participating in the elections. Around 10 a.m. on April 19, I was told to be ready for an unspecified "additional party." By 1 p.m., I got the official word: Inkatha was in. Now there were 19 parties in the national election. The problem was, however, that the ballots had 18 parties printed on them; tally forms for counting all the ballots had 18 boxes; computer input screens for these forms had 18 fields; and – you guessed it – electronic records for transmitting results to the news media were built for 18 parties.

The ballots – larger than this magazine page with full four-color pictures of each party's flag and leader beside its box – had been printed weeks earlier in England. It was too late to reprint these elaborate sheets, so a sticker with the Inkatha flag and a picture of the Zulu party leader, Chief Mangosuthu Gatsha Buthelezi, would be affixed. It was also too late to reprint all the thousands of tally forms, so Inkatha's name would be added by hand. The computer screens and the electronic transmission form could be fixed, but it took time, and the software had to have the parties in same order as the paper forms. Except now we didn't know what those tally sheets would look like. I talked to Lisa Thornton, who was coordinating work on Inkatha. She was meeting with the commission at 5 p.m. to figure out how to get tens of millions of stickers printed and distributed in a matter of days. She'd try to get me answers after the meeting, but she couldn't promise anything. There was so much to do.

"Less than the amount of work emergency-room doctors and nurses and undertakers would have to do otherwise," I said.

"Yes, of course," she said. "This is good news, but –"

"How much more good news can we stand?"

Now, almost the entire political spectrum was participating in the elections; it was all the more important that the elections be credible. It was like living on camera. Billions of people would watch every gesture, every line of code. The whole election funneled through our work. It was as if I were working in a sandwich shop, and God walked

BOUTA YA GAO KE SEPHIRI ŠA GAGO



O tla be o le nosi ge o bouta.



Pampiri ya go bouta ga e na aterese, nomoro goba leina la gago.



Ga go yo a ka go botsago gore se ke pampiri ya gago.

GA GO YOO A TLA TŠEBAGO GORE O BOUTELA MANG

There were roughly 1,000 counting centers with an average of 2,500 ballots per center – or a total of 25 million ballots.

Because I was one of the few software people with elections experience, I was quickly assigned to design the vote tabulation system.

This was no small task. In recent white-only elections, the results from the entire country had been produced on a Lotus spreadsheet. But with the black majority swelling the number of voters from about 2 million to 25 million people, this election wasn't a spreadsheet problem. Voting was to take place over three days, from April 26 through 28 and was later extended a day. On the evening of the last day, the polls would close, and all the ballot boxes would be trucked to counting centers to be tallied.

There were roughly 1,000 counting centers. As each batch of ballots was counted, a tally sheet would be filled out, showing the votes for each party. This sheet would then be faxed to the commission. We expected an average of 25 batches from each center, which meant 25,000 tally sheets. It would have taken a month and a half, day and night, to fax these tally sheets on one fax machine. Fortunately, we had dozens at the commission dedicated to receiving the forms.

The tabulation system processed these

flower child, expert in databases. The South Africans included Etienne Posthumus, a 22-year-old software wonder boy. We worked elbow-to-elbow on laptops set up on rickety, folding metal tables. Power failures sometimes left us working by the light of our screens. A foxhole wouldn't have been a bit more intimate.

We dressed as we pleased, worked the weirdest hours in the building, and survived on Brazilian coffee, Coke, and strange candy bars. I'm not sure how much confidence a bunch of caffeine- and sugar-hyped hackers in dirty jeans inspired, but nobody gave us trouble. Maybe they were afraid to ask.

With 13 days until the count, we of the dawn patrol had designed a software architecture and a paper flow for tabulation. We built databases tracking parties and results. The databases for voting and counting centers should have been complete, but new centers had to be added as huge new chunks of population were uncovered and as prospective centers were bombed or burned down.

"It's a quiet day," a commissioner told me, his dry Scandinavian humor belying the

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THOSE WHO APPRECIATE QUALITY ENJOY IT RESPONSIBLY.

in and said, "The fate of 40 million people depends on the salami submarine I'm ordering, and hold the onions." Everything was doable, but the stakes were high enough to be unreal.

Late that night, there was a thunderstorm. I got to the hotel just ahead of the rain, and wrote input routines on my laptop in the dark, watching the lightning. The rain washed away much of Jo'berg's grime and reek. By now I was pacing myself, working only 14-hour days. I would need my strength when counting started.

The next day we completed the data structures, and I got an input system running that expected 19 parties.

With a week left, Bob and I took a rare evening off (which is to say we quit at about 9 p.m.) and went to a party. We returned very late, and I stayed up to do a little work. Consequently, I was sleeping in the hotel the next morning when a white man reportedly left a car containing about 200 pounds of plastic explosives on Bree Street, a block away. The explosion rocked the hotel and wounded 100, killing nine. It was the largest car bomb in South African history.

I immediately thought the bomb might

have been targeting the commission – sabotaging it would have delayed the elections and probably started a civil war – but when I called the offices there, Mario answered the phone. I went to a window and looked down on the destruction. A cloud of smoke rose

I'm not sure how much confidence a bunch of caffeine- and sugar-hyped hackers in dirty jeans inspired, but nobody gave us trouble.

languidly from the bomb site. A water main was broken, carrying the red soil away, resembling a river of blood. There were shattered windows on all sides, and the storefronts were destroyed. The roof on one building had collapsed. Bob and I went out to investigate. It was at once calm and threatening, like being inside the barrel of a gun. Twisted cars were strewn about like neglected toys. Nothing remained of the bomb car.

That night, I was wakened by another bomb directly outside the hotel. The hotel

was full of foreigners, mostly election observers, and someone was trying to scare us off. I felt like a sleeping target.

Four days before the count, the old South Africa vanished when, at midnight, officials lowered its flag at the Parliament building in Pretoria and hoisted a colorful new one: black, green, gold, blue, red, and white, incorporating the colors from every South African political party.

Voting started the next day. Counting wouldn't start until all voting was finished, in four days, but, feeling this was the last opportunity for violence to derail the elections, everyone was edgy. The authorities ran extra patrols of bomb-sniffing dogs through the commission, and most of us went home early, although I didn't feel much safer in the hotel.

By counting day, everything was ready to go, despite some last minute database changes demanded by our supervisor. About 11 p.m., the first results trickled in.

By 1 a.m., we were reporting a million votes cast. But that struck me as too few – the results weren't being reported fast enough, so I was called upstairs to report on progress.

Because of the database changes, we were reporting only half our results to the South African press. The other half couldn't be reported until a tricky program called the Summarizer, which totaled the votes for each party and cross-checked the totals, was fixed to account for the database changes. We were sitting on close to a million votes that weren't being reported to the world. I agreed to have this fixed by 2:30.

I went back downstairs to a scene of total chaos. Not only did we have a nasty software fix ahead of us, but now the server was refusing connections, so only about a dozen of the 24 data entry stations were working. Faxed tally sheets from the counting centers – hundreds of thousands of votes – were piling up, and the world was waiting. The whole election was inside that server, and if it was sick we could lose everything if we touched it. It was a pretty scary situation, but I decided we'd have to reboot it anyway. We got it down at about 2 a.m.

Geva Patz was working on the server. He found a hardware fault, pulled the offending unit, and managed to get the server back up in 15 minutes. All the data entry stations

worked flawlessly. Neil Cawse fixed the Summarizer in a shade over 15 minutes. There had been no data feed to the media for half an hour, and they would start to scream any minute. We turned the live data feed to the world back on. If any of the sleep-deprived

**It was as if God had walked
into a restaurant saying,
"The fate of 40 million people
depends on this salami
submarine. Hold the onions."**

programmers working on the Summarizer had made a mistake, it would show up on millions of TV screens in a few minutes, probably as drastically wrong results. We went over to the transmitting computer and held our breath as we watched the vote totals. Through bleary eyes, we saw reasonable numbers of votes scrolling across the screen. I stayed until Mario and Etienne showed up mid-morning.

Two days later, with results from all over the country showing them getting close to two-thirds of the vote, the African National Congress declared victory. Several of us from the commission crashed the victory party, which was across the street at the Carlton Hotel. Only a month earlier, people had been hacked to death here by machete-wielding rioters. That night, Jo'berg had emptied its population onto the streets, and both the commission and the Carlton were surrounded by a sea of exuberant black faces. I waded in, carrying four paper South African flags – of black, green, gold, blue, red, and white.

As I rounded the corner of the hotel, a middle-aged woman wearing a scarf was thrown against me by the crowd. She saw at my flags, looked at me excitedly, and asked, "May I have one?"

I obliged without hesitation, aware of the irony: it was her country, but I was handing out the flags. ■ ■ ■

Erik Nilsson (erikn@cpsr.org) coordinates the CPSR Computers and Elections project and is a software consultant in Portland, Oregon.

*This Christmas give a
gift that's been laying
around for twelve years.*



Bringing Up RoboBaby

Can a machine become conscious?

Not by spoon-feeding it a ready-to-run consciousness program,

says the Media Lab's **Rodney Brooks**.

A machine that interacted with the world as an infant does,

on the other hand, might be a different story.

ELECTROSPHERE

By David H. Freedman

The humanoid known as Cog is composed of black and chrome metal beams, canister-like motors, and lots of wire and cable. Its torso is mounted on an electronics-crammed pedestal. Cog has one arm with a three-fingered

hand. Special compliant joints give its moveable body parts a less rigid, more life-like feel than conventional robot parts; if you push on Cog, Cog gives a little, but pushes back. Its skull doesn't resemble a human's, though it does have two eyes; each consists of a pair of cameras, one a fisheye lens to give a broad

view of what's going on around Cog, and one normal lens to give this humanoid a higher-resolution view of what's happening directly in front of it.

led by Rodney Brooks, head of MIT's Mobile Robot Laboratory. With his wavy, longish brown hair, slightly chubby build, surfer shirt, and sandals, Brooks could pass for an aging Beach Boy. He is also just a little nerdy looking, his soft features often lined with the strain of all-night programming marathons. "I don't trust anyone else with the low-level bit-slinging," he explains.

But despite his aura of unpretention, Brooks is one of the rising stars of artificial intelligence. He and his lab are best known for creating so-called "insect robots," shoe-box-sized, multi-legged machines capable of scurrying along hallways and over obstacles without bumping into things or getting stuck. Before the insect robots made their appearance in the late 1980s, getting robots to navigate around obstacles meant providing them with a software "map" of their surroundings; the software knew that there was a chair 22 feet ahead, for example, and a wall 6 feet to the right. Every time a robot took a step, the software would locate its new position on the map, then calculate the best direction for the next step.

Brooks's robots, however, had no maps and no programs for calculating where they should go. Instead, each robot was provided with a slew of miniprograms, each of which represented an extremely simple "behavior," such as "shift rear legs back" or "turn slightly to the right." All of these behaviors competed for control of the robot at any point in time. The winner was determined not by a central control system, which was non-existent, but by interaction with the environment: the slant of the terrain, the location of obstacles, the movement of a nearby object. In effect, the insect robots were not thinking but reflexively reacting to their surroundings. This happens to be how real-life animals do it: you don't have to continually ask yourself where you are on a map in a room in order to calculate your next step. You just look and move.

Cog is strong enough to rip out its own cables – or to perform an analogous service on any nearby human being.

The cameras bear little resemblance to human eyes, but the fact that they are lenses mounted at the right place on a head-shaped object is enough to give the motionless Cog an eerie aura of awareness, even menace. This irrational feeling is heightened by the presence of two large, red kill switches mounted on either side of Cog for handy access should it unexpectedly do something dangerous. Cog is strong enough to rip out its own cables – or to perform an analogous service on any nearby human being.

Mentally, though, Cog is a newborn who can do little but wiggle its body and wave its one arm; it makes the lip-synching, beer-bottle-waving Pirates of the Caribbean look positively gifted. But unlike the pirates, Cog will get smarter and smarter. The hope is that it will prove the best way to make intelligent robots isn't to program them, but to raise them from infancy much like children.

Cog is the creation of a team of scientists and students



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his way of thinking to catch on. Now it's hard to find a robotics researcher who isn't working with some sort of subsumption-like technique. NASA, conservative as it is, will be sending a Brooks-inspired robot to roam the surface of Mars in 1997.

But having climbed to the forefront of AI, Brooks was loath to settle into a status quo of merely turning out slightly better versions of his previous robots. The most sophisticated robot his lab had ever produced was Polly, a small, roving trash can that still accosts visitors, coat racks, and other vertically oriented objects with an offer of a gabby lab tour. "By the way," blabs Polly's canned speech module in the middle of her tour, "I don't understand anything I'm saying."

By 1992, Brooks found himself casting about for a way to make a big splash. In hopes of inspiration, he took off on sabbatical to Europe and Asia. In Japan, where AI researchers are, oddly enough, a great deal less conservative than their US counterparts and often talk about building computers out of neurons or brains of silicon, Brooks decided what he wanted to do next. He telephoned Cynthia Ferrell, one of his top graduate stu-

dents, ostensibly to check on the progress of her thesis, but he finally blurted out that he wanted the group to build a humanoid.

Ferrell, a slight, earnest woman who nevertheless radiates a certain brashness that seems pervasive in Brooks's circle, knits her eyebrows as she remembers: "I was sort of

**NASA, conservative as it is,
will be sending a Brooks-
inspired robot to roam the
surface of Mars in 1997.**

surprised. I mean, we had talked about scaling subsumption up from insects, but the plan was supposed to be to work our way up through iguanas, dogs, and slowly on up the evolutionary scale."

Cog now sits in an AI version of a labor and delivery room. It is surrounded by banks of electronics that provide its brains and give Cog's creators a window into its world. A 6-foot-tall rack of boards containing Motorola 68332 16-MHz chips supplies the processing

power; eventually, Cog may have as many as 256 of these chips, each one capable of powering a Mac II. An array of 20 small monitors shows what Cog's eyes are capturing and how those images are being processed by its vision system.

From a software point of view, Cog is being given the bare basics: some primitive vision, a little uncomprehending hearing, some sound generation, some rough motor control. But that's exactly the point. Instead of having behavior handed to it in a ready-to-run program, Cog is supposed to develop behaviors on its own, like a human infant. Instead of playing the piano, "conversing" with visitors, or welding car parts, as other robots have been programmed to do, Cog will groan and coo, stare at colorful objects, and flail its arms in an effort to grab things. It will be programmed to crave attention and be captivated by human faces. It will experience physical contact, thanks to touch-sensitive sensors. Cog even wants to share your pain—temperature and load sensors will alert it to being overworked or injured.

Brooks isn't the first AI researcher to emphasize learning. Where others have gone



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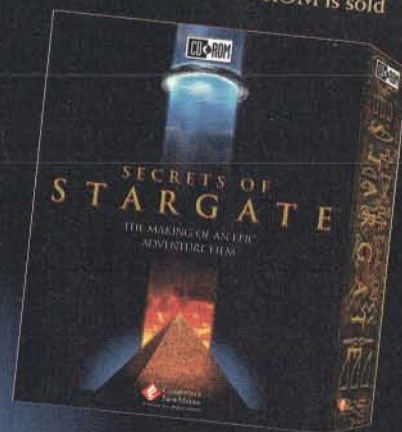
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wrong, though, he asserts, is in imprisoning their learning programs in a computer that has little or no direct input from the real world—an approach he calls the “brain in the box.” Intelligence, he says, can only be developed through interaction with the outside world.

Having already plumbed the lowest levels of interaction-based intelligence through his insect robots, Brooks has, in a way, succumbed to the very ambition among many of his colleagues he used to loudly criticize: seeing his ideas applied at the opposite end of the spectrum, to human-like intelligence. But, to develop anything resembling human intelligence, according to his theory, you must have human-like interactions with the environment. And that means you have to have a relatively human-like body. Hence Cog. In fact, since human-to-human interac-

Cog will have a soft rubbery face. “I want people to touch Cog, stroke it, say ‘Good robot,’” explains Ferrell.

tions are among the most important in giving rise to our intelligence, Cog will eventually be provided with a more personable exterior to facilitate its mingling. For starters, it'll get *Star Wars* stormtrooper-style body armor and a soft, rubbery face, complete with plastic eye-coverings that will create a sort of Bart Simpson look. “I want people to touch Cog, stroke it, say ‘Good robot,’” explains Ferrell. (Cog's dimensions were roughly modeled after Ferrell's; Ferrell also came up with the name Cog, a play on “cognition” and gears.)

Brooks holds fort in a cramped office with a perpetually hissing HVAC system, alongside a bronze platter he has set up as a desktop gong. He is a likeable wiseguy, an AI agent provocateur who wields a witty arrogance and professes to have no interest whatsoever in any sort of compromise. “I've always believed subsumption is all there is to intelligence,” he says. “Other robots don't have anything resembling the intelligence of living creatures.” His motivation for leaping into humanoids, he explains, is his belief that he has only one good project left in him before he's “old and cranky and complaining that no one listens to my ideas.” Despite the head-shaking and smirks he says he encountered in his early presentations at AI conferences, he sees it more of a case of his being the first researcher to have to the guts to go for the

brass ring. “Scratch all the AI researchers and you'll find that building a humanoid robot was their original motivation for getting into the field,” he says. “The jaded ones won't admit it because they're used to saying politically correct things to funding agencies.”

Besides Ferrell, who oversees the project, Cog has also pulled in about a dozen other students and faculty. One key player is Joanna Bryson, an AI graduate student who used to do high-powered programming for a securities-trading firm. Her greater interest, though, was in child-development theory. “By moving and trying to explore their environment, infants get a basic repertoire of a few-hundred conceptual metaphors, like self/other and front/back,” she explains. “Everything else they ever know is built on these metaphors.” By learning these simple concepts through, for example, watching itself wave its hand, Cog might be able to similarly build itself up to a higher level of intelligence. Still, Bryson admits, she found Cog kind of creepy at first, though not anymore. “I like androids now,” she says, patting Cog on the shoulder. “They're my friends.”

Also on the Cog team is Daniel Dennett, the outspoken philosopher from nearby Tufts University, whose controversial book, *Consciousness Explained*, propelled him a few years ago to the front lines of the debate over whether or not a machine could be made conscious. Dennett says yes, but not, as a practical matter, by spoon-feeding a computer a ready-to-run consciousness program. A machine that interacted with the world as an infant does, on the other hand, might be a different story. If Cog does manage to develop anything resembling awareness, he says, the world won't have trouble accepting it. “My prediction is that the Cog team will have the opposite problem,” he says. “When Cog starts gesturing and moving its eyes in a humanoid fashion, they'll have to devote themselves to explaining to the world that Cog *isn't* conscious.” Cog may never achieve anything like consciousness, but Dennett, like most of the Cog team, holds the relatively modest hope that Cog will acquire at least a few of the cognitive capabilities of a human toddler. Such an achievement would at least prove that the approach is valid.

The AI community as a whole is less optimistic about Cog's chances of proving anything. After Brooks's insect robots made a lot of researchers look bad, few are quick to openly count Cog out. But many speak of the

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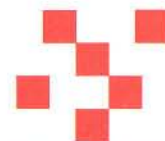
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project not as a potential breakthrough but as a harmless, interesting stunt. "I don't know if the hand has to be humanoid or the eyes have to be 3 inches apart," says James McClelland, a Carnegie Mellon AI scientist and one of the pioneers of the modern neural network movement. "But it's just as easy to make the eyes 3 inches apart, and if it gets Brooks somewhere, I'm all for it."

One researcher who has been decidedly frosty toward the Cog project is Marvin Minsky, the AI pioneer who founded MIT's AI Lab, but who now spends more time at the school's Media Lab. Minsky's clash with Cog is ironic, since he has always been an ardent fan of the idea of human-like robots and because Cog probably comes closer than any other AI endeavor to embodying Minsky's otherwise noninfluential "society of mind" theory: that intelligence comes not from a

**"I like androids now," says
Bryson, who studies child
development theory.**

"They're my friends."

central program, but from many independent, interacting programs. This is just like the subsumption approach. Posters for two of Minsky's books hang on the wall just outside Brooks's office.

Yet Minsky's first interaction with the Cog project was to crash and flame an informal presentation to graduate students Bryson was giving at the AI Lab. Minsky's objection to the project was that building a sophisticated robot like Cog forces graduate students to spend a large portion of their time on lowly hardware problems that won't qualify them for good research jobs later on. Instead, he says, Cog should be built as a software simulation because robotics research is really a software problem. It sounds like a simple point, but it took Minsky nearly 1 1/2 hours to make it, during which time he permitted little interruption. MIT professor and Cog team member, Lynn Stein finally blew a fuse and demanded that Minsky give someone a chance to respond, but Minsky refused, complaining that "everyone else talks so slowly." When Brooks, who had been tied up in a faculty interview, finally heard of the carnage he raced to the scene and heatedly defended the project. Later, Brooks sent Minsky a polite e-mail message thanking him for his attendance and challenging him to an open debate about Cog. Minsky, however, after

initially agreeing to the debate, stopped answering Brooks's mail. (Minsky wouldn't respond to my e-mail either.)

Minsky's complaint about the impact of the project's consuming "grungework," as Bryson calls it, on the graduate students' careers is in fact one that sometimes troubles the group. Ferrell says that though she herself plans to continue to work with hardware robots as a career, she wonders if some of the other students are getting all they should out of the project. Brooks concedes there's a downside to working in his lab, but notes that he warns prospective students about this before taking them on. "Some of them eventually end up complaining that they don't get to publish as many papers as other students," he says, "but I remind them that they're going to leave here with the most fabulous robotics demo video anyone has ever seen."

Even if it were clear that the hardware chores were a waste of students' time, Brooks could hardly settle for a software simulation, as most other robotics researchers do. That's because the whole point of his robotics work is to prove that intelligence emerges not from a canned program, but from interaction with

the real world. Of course, one could attempt to simulate the real world so that a simulated robot could interact with it, but Brooks contends that simulated environments are cartoon versions of real ones, with the result that interactions with them lead to cartoon versions of intelligence. He notes that artificial-

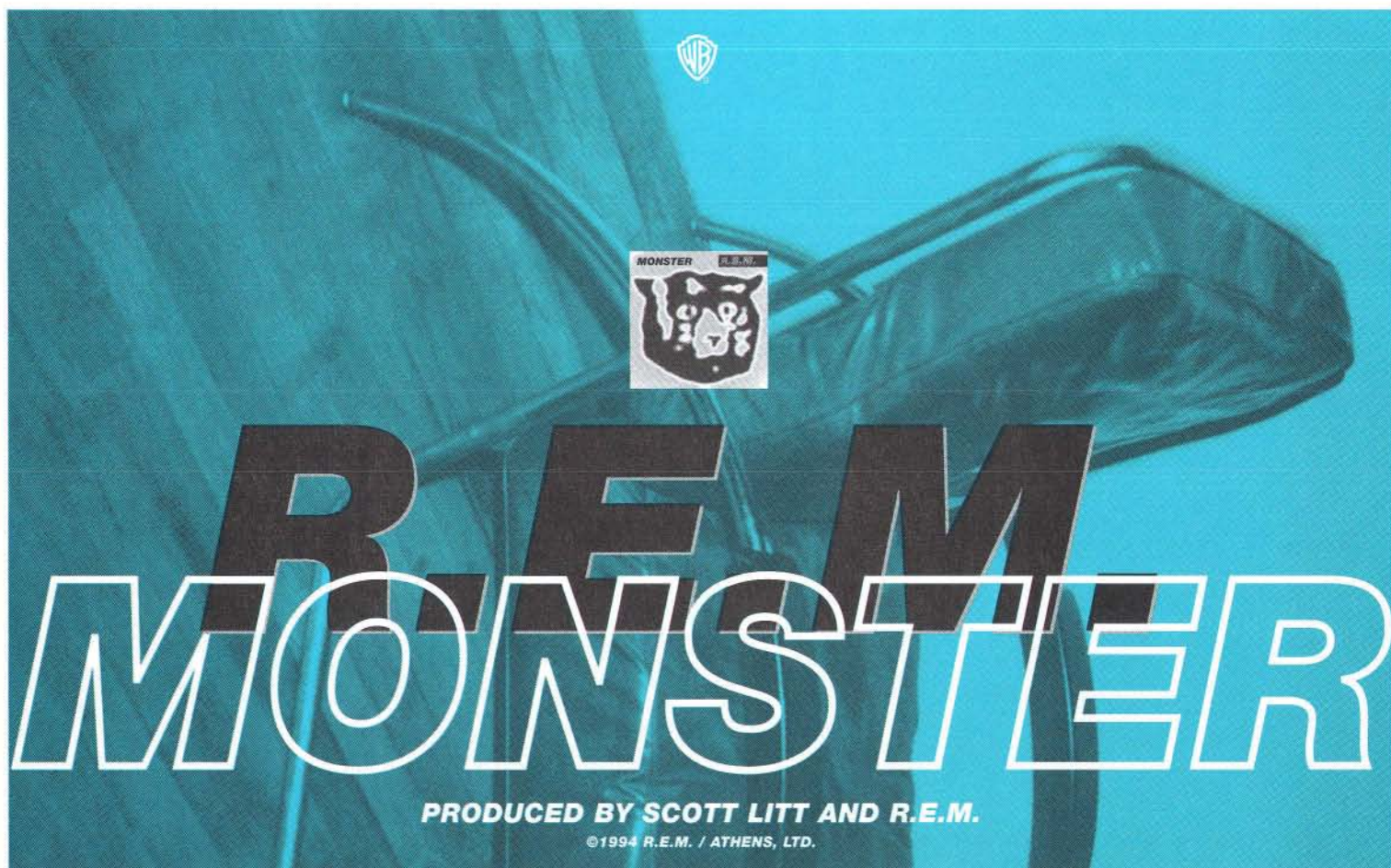
**"It's easier to build
something in the real world
than to make a good simulation of the real world."**

life researcher Karl Simms, at nearby super-computer manufacturer, Thinking Machines, recently programmed a simulation of how creatures might develop the ability to move quickly on a simulated landscape carefully imbued with the laws of physics. The result was that the creatures evolved into very tall, treelike objects that simply fell over, reaching impressive speeds during their plunge. "Things that develop in simulations learn to exploit the hell out of flaws in the simulations," says Brooks. "It's easier to build some-

thing in the real world than to make a really good simulation of the real world."

One disadvantage to building in the real world is that it costs more money. Cog is a politically incorrect project, because it won't improve missile accuracy or lead to a better auto transmission, and it has so far failed to attract a single nickel in funding. The project has been kept afloat from a modest reservoir of unrestricted research grants Brooks had been hoarding, and that's running out fast. On the other hand, the insect robots were slow to catch on with funders, too, but ended up superstars. Brooks even started a company to manufacture them, so that robotics researchers could experiment on them with their own software. Maybe Cog's cousins will similarly end up in labs around the world, cooing at researchers who smile at them. If not, at least Brooks will have a fabulous demo video. ■ ■ ■

David H. Freedman (dhf@aip.org) is author of Brainmakers, a book about new approaches to the study of artificial intelligence. He is also a contributing editor at Discover magazine.



Media T y p h o o n



To prevent a Communist clamp down
on Hong Kong in 1997, publisher Jimmy Lai is unleashing
a storm of muckraking today.

By Jeff Greenwald

Hong Kong is a strange beast, a schizy megalopolis with an awful lot of money and very little soul. At eye level it's shops and bars, but up above, it's strictly business: giddy monoliths of marble and steel drip air-conditioner water onto pedestrians below. Heavy clouds drop dark shadows into the South China Sea, and the humidity

makes clothes stick to the skin like Colorforms. Climbing out of the Quarry Bay MTR subway station into pork bun-steam heat, I slog past fashion outlets blasting meat-locker cold. Sweat freezes to ice in the nape of my neck, only to boil off again a few seconds later.

I'm looking for the coolest man in town. Five minutes later, buzzed through new security doors into

the offices of *Next* magazine, I find him.

Jimmy Lai sits at a round table, hands folded. Hong Kong's most notorious media maven is 46 but looks well under 30. His crew cut is thick as a carpet, without a single gray hair. I can't see a line on his cherubic, almost beatific face – or a sweat stain under the arms of his tailored shirt. It's hard to believe this is the same guy who's being threatened by organized crime, hounded by vandals, and sued for libel by the People's Republic of China.

Lai is a legend in Hong Kong. In 1960, at age 12, he was smuggled here from Canton in the hull of a boat. The former street urchin took a succession of jobs in garment factories and picked up some English along the way. Smart and ambitious, he quickly rose through the ranks until, in 1975, he started his own clothing line. Giordano (named, oddly, after an Italian restaurant in New York) now has 600 stores throughout Asia, pulling US\$350 million in annual sales. But Lai became bored with retail.

The offspring of his ennui was a ground-breaking weekly called *Next*, conceived on June 4, 1989, as Lai sat in his Hong Kong living room glued to the Cable News Network's coverage from Beijing.

"I got the idea to do this magazine during the Tiananmen massacre," he nods. "The fact that the Chinese government was responding to the demand for democracy by shooting people – that they were completely unable to deal with the demonstration – showed me just how desperate and doomed they were. I realized right then that there was no reverse role for China. It would have to open up to the free flow of information; and when it did, it would be the biggest market in the world."

Tiananmen was China's first lesson in the realities of contemporary media technology, and it was a brutal one.

"The Chinese government had no idea the media was so powerful," Lai leans back in his chair, thumbing his suspenders. "Otherwise, I don't think they would have dared handle the events of June 4 the way they did. The price they paid was higher than any they could have imagined. No dictatorship, no government in history has ever been exposed to the world as instantly as the Chinese government was during that massacre."

Lai's response to Tiananmen has been to twist the knife. Using information as a weapon – or, more accurately, a crowbar – he's trying to forcefully jimmy the lid off one of the world's most xenophobic and information-starved nations.

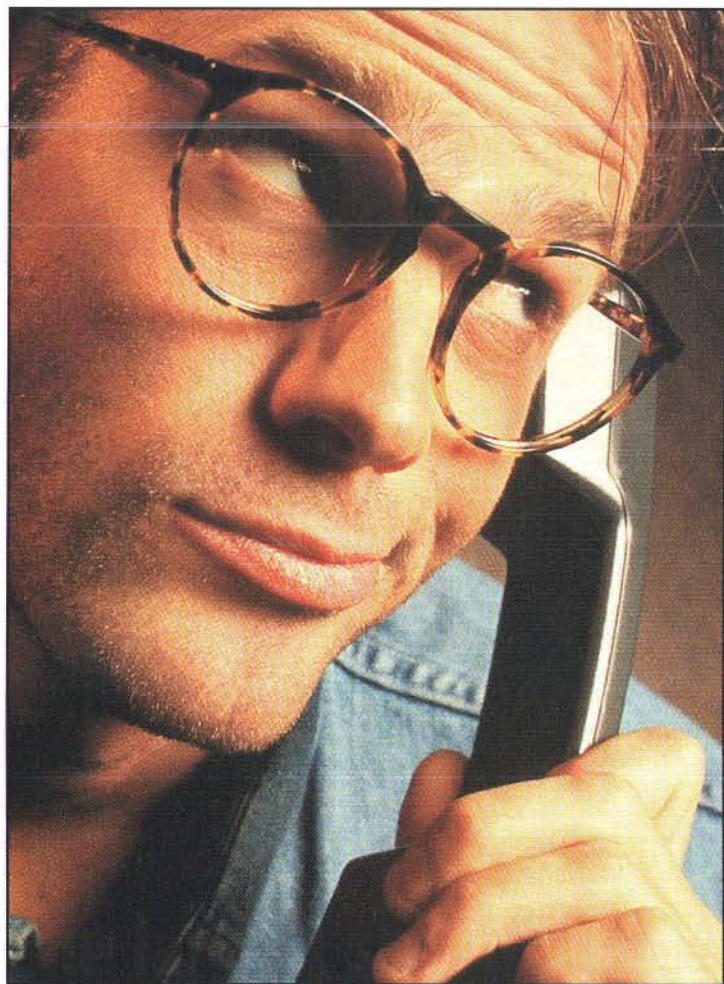
"I've always wanted to change things," Lai's stocky, compact frame conceals restless energies; I wouldn't be surprised to learn he was a martial arts expert. "The events of June 4 gave me the inspiration I needed. Now I'm no longer in a business that just delivers merchandise and makes money; I'm in a business that delivers information – and information is freedom. That's a great motivator for me. I've never been able to relate to my home country, yet now I'm directly involved in bringing more freedom to the Chinese people."

This kind of idealism might seem naive to jaded westerners, but the situation in Hong Kong demands it. The territory, ceded to the British for 99 years in 1898, reverts to Chinese control on July 1, 1997. Free-market visionaries like Jimmy Lai have a real interest in preserving freedom of information, and it's hard to imagine a better way to trump the incoming regime than by establishing a popular, fearless magazine.

Using information as
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The first issue of *Next* was released in March 1991 – less than two years after the Tiananmen blood bath. The weekly glossy magazine comes in two parts: a news, finance, and features book, and an equally thick entertainment/lifestyle section. Stories have included exposés of the powerful Chinese criminal organization known as Triad, reports on prostitution, and investigations into alleged government corruption. The latest issue, Lai's boldest so far, features a cover story on how communist China enforces its "One Family, One Child" policy with arrest, blackmail, and forced abortions. Retailing for about \$2.50 an issue (\$18 HK), *Next* already has a weekly circulation of 180,000, and a readership of more than 1 million, making it Hong Kong's largest circulation weekly. What makes this remarkable is that it's published only in Cantonese; there's no English-language edition.

"*Next* is for the educated Chinese middle class," Lai explains. "There's really no market for an English-language weekly. If the English speakers want information, they don't need an indigenous magazine; they can read *Fortune*, *The Economist*, or the

International Herald Tribune."

For many Hong Kong residents, *Next* is a godsend, an indication of what might yet be possible in a country where idealists are few and the obsession with getting rich (and get-

By indicating what might yet be possible in a country where idealists are few, *Next* is a godsend for Hong Kong.

ting out) dominates contemporary thought.

"Jimmy Lai is a genius," one Hong Kong gallery owner summed up, "and *Next* is a miracle."

Not everyone, however, is as infatuated. Early last summer, Triad thugs broke into the *Next* offices and smashed the magazine's computers. The Hong Kong storefronts of Giordano have been spray painted, and Lai's house has been targeted by firebombs. But Lai grew up in the ghetto and refuses to be intimidated. "If they threaten me, they won't kill me," he wryly observed in a *New York*

Times interview. "If they want to kill me, they won't threaten me."

The most serious threat to the magazine, of course, is the specter of 1997. The imminent transfer of power looms like the twilight zone, an ominous threshold beyond which nothing can be assumed. It is something no longer even talked about; the switcheroo of '97 has become one of those rare scandals in which anticipation has worn itself threadbare, and speculation has dissolved into a deep existential weariness rooted in the knowledge that no one really knows squat about what's going to happen. Things have reached a point where one person's guess is no better than another's, where the well-honed predictions of an economics PhD are no more or less likely to come true than the wildest ravings of the blind leper rattling his cup in the Jardine House overpass.

Still, it does seem unlikely that the Chinese, never known for open-mindedness, will tolerate a magazine that openly busts their chops. Last August, in fact, Chinese authorities closed down a trendy new Giordano outlet in Beijing. The action was clearly a response to one of Lai's editorials, in which

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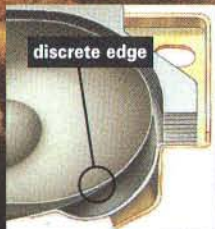
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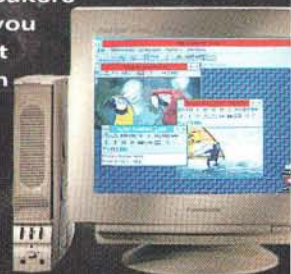
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he blithely asked Chinese premier Li Peng to drop dead (the move inspired Lai to resign as

nist bloc. There's simply no market for that kind of equipment anymore, and nobody's

The Chinese government can stop the print media, says Lai, "But they can't stop electronic media. Information technology is advancing by the day."



chair and director of the clothing chain). What's to stop the new regime from using similar strong-arm tactics against a pesky free press?

Jimmy Lai shrugs. "They can stop the print media," he allows, "because they can physically stop the presses. But they can't stop the electronic media. Information technology is advancing by the day, while the technology for disrupting the flow of information has stagnated since the collapse of the commu-

puting any money into researching or developing it, either.

"OK, a lot of governments think they can control the media. And some governments can – like in Indonesia, where they've been closed off from the outside world for years." He slaps the table for emphasis. "But if China thinks they can control us, they don't understand the state of technology today. Even if they can control 90 percent of the media – and the costs of doing that would be prohibi-

tive – but even if a government was crazy enough to spend that kind of money, the surviving 10 percent would still be powerful and efficient enough to keep the population informed.

"There are two reasons why I'm optimistic about our chances for survival after 1997," Lai smiles and leans forward. "First of all, within three years we'll probably see the death of Deng Xiaopeng. What kind of changes will that bring? Nobody knows. Great change is inevitable after the passing of such a strong man; no one can replace him. Secondly, by 1997, what new tools will exist for disseminating information? Again: nobody knows. But I can guarantee you that they won't be able to stop television. And if they can't stop that," he concludes with satisfaction, "what's the point of trying to stop us?"

China, meanwhile, has shrewdly taken another tack. In July of 1994, the People's Republic sued *Next* magazine for libel.

"There was a 'Campaign of Hope,'" Lai explains wearily, "to build schools in poor areas of China. Nine million US dollars were raised. Months went by, the people didn't

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receive the money, and *Next* printed an investigative story to that effect. The Chinese government responded that the transfer of money was in process, but that their infrastructure moved slowly. Then they turned around and sued, claiming that our story would damage future fund-raising drives. We just printed the facts," he says evenly, "but the case is going to court."

Nothing short of bankruptcy, though, is going to stop Lai from becoming the top information broker of the new China. He has already announced his intention to acquire a high-profile daily paper and is waiting (but not holding his breath) for an opportunity to expand into the new economic zones of South China—a move that could instantly increase the magazine's circulation tenfold. His dreams are more ambitious still. In October of 1993, speaking at the World Free Press Conference, Lai proposed creating a "United Nations of Free Media." He envisions the quasi-political collective as a multimedia task force, modeled on the UN and dedicated to preserving freedom of information around the world.

"World peace depends on the free flow of information," he declared. Under the collective's imagined charter, governments that seek to limit such freedoms (e.g., China) could be saddled with crippling information embargoes. A sideswipe onto the cold shoulder of the information superhighway, observes Lai, may some day be far more effective than an embargo of material goods.

The venue for this new organization? Styly: "Hong Kong." And why not? Locating the planet's top information watchdog in Hong Kong—mere months before the region rolls under the wheels of the People's Republic—would be a stroke of genius. Such a move would put China's leaders in a real fix: either they virtually guarantee a free press in the region or face loud protests and international suspicion. What's a dictatorship to do?

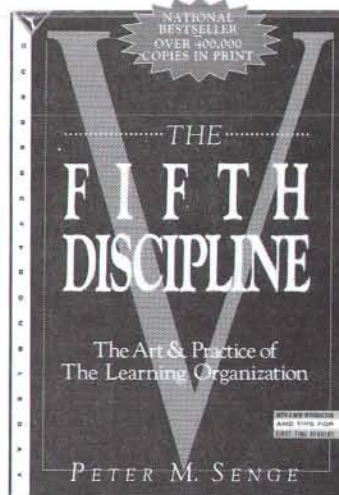
When I left the offices of *Next* magazine, I reemerged into the sauna of summertime Hong Kong. It was rush hour. A Petite Chinese woman barked into a cellular phone, while harried bankers and *kwai lo*—the Chinese term for "ghosts," meaning "foreigners"—rushed from air-conditioned offices into air-conditioned taxis. I had to laugh. Six million people obsessed with keeping cool—and Jimmy Lai, turning up the heat. ■ ■ ■

Jeff Greenwald is a contributing editor of *Wired*. His "Big World" is a biweekly feature on GNN's Travel Resource Center.

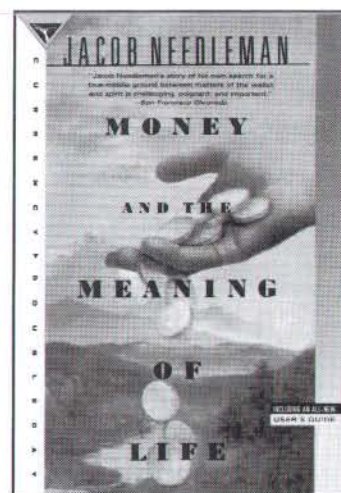
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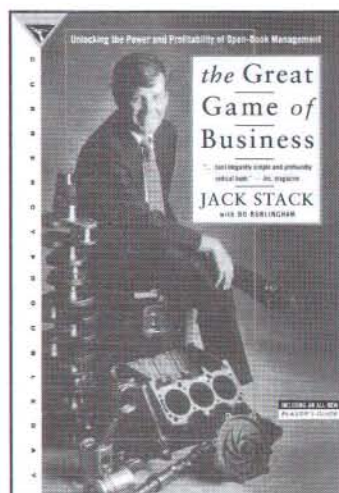
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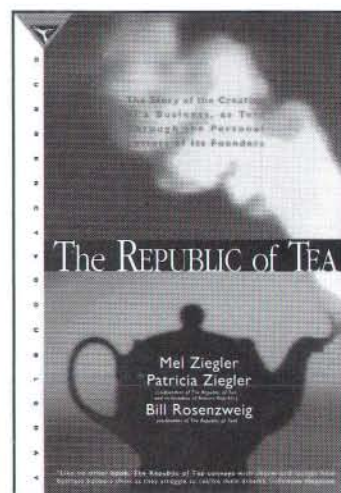
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Power to the People

**The Clinton administration is using the Net
in a pitched effort to perform an
end run around the media.**



By Evan I. Schwartz

In the basement of the rococo Old Executive Office Building, adjacent to the West Wing, a college intern is diligently scrolling through the previous day's batch of 762 electronic-mail messages sent to the president over the Internet.

As he reads each letter, the intern tallies up the view-

points on a special form. Haiti, health care, and welfare reform top the big political issues of the day. But, as usual, the biggest category of e-mail concerns Bill Clinton's overall job performance. As is typical, this batch is strongly running in the president's favor, nearly 2-to-1.

Why does the daily load of electronic mail consistently bring such fresh air in from the humid boil enveloping the

Not surprisingly, people who work at the White House believe the answer is c. "There is a different flavor to e-mail as compared with snail mail," says Stephen Horn, the only full-time employee assigned to reading and summarizing the more than 5,000 Internet messages the president receives each week. "E-mail is generally more supportive of the president," Horn adds. "Perhaps people on the Net are more educated and can get around the spin in the press. They can get official documents firsthand. They can draw their own conclusions."

In short, opinion-making on the Net is unmediated.

To a certain group of techno-literate staffers at the White House like Eller and Horn, the Net is not just a mechanism for receiving mail. It is emerging as a full-blown forum for conducting the country's political affairs. While the vast majority of the public gets its dose of political information from television and newspapers, the citizens of the Net are plugged directly into their government. On a daily basis, subscribers to America Online, CompuServe, and Prodigy, as well as other denizens of the Internet can download and read a stack of new policy papers, speeches, and transcripts of conversations put out by dozens of departments within the Clinton administration. In the past, only reporters and lobbyists saw these documents.

All this surfs the fine line between information and propaganda. And it could be viewed as either, depending on your political persuasion. White House staffers tend to view the Net as a ballast against the out-of-control mass media and Washington press corps. And they believe the public is sympathetic – that there is as much anger against the media as there is against government. These days, it is easy to argue that the prevailing tone of the political press – one of detached skepticism – has not only outlived its usefulness, but has grown into an infectious brand of cynicism that permeates society. "The press assumes that everything we do is either wrong or politically motivated," laments Eller.

By holding "town meetings" around the country and by establishing a growing presence on the Net, the Clinton administration is making a pitched effort to perform an end run around the media. Not surprisingly, the inside-the-beltway press corps does not like the idea of giving up its role as the filter through which the public sees its government. *ABC News* political analyst Jeff Greenfield, for one, believes that politicians who play with unmediated communications are playing with fire. "He who liveth by



To a certain group of techno-literate staffers at the White House, the Net is emerging as a full-blown forum for conducting the country's political affairs.

White House these days? At first, senior staffers were puzzled. "People on the Net seem to have a very different impression of the administration than the people who read *The New York Times* and *The Washington Post* every day," says Jeff Eller, the director of the President's Office of Media Affairs.

At the time of my visit in August, opinion polls had the president's performance rating sinking fast below the 50-percent mark. Over the past year, Bill Clinton has been besieged by the media for everything from Whitewater to foreign-policy flip-flops. The traditional paper mail from voters is running close to what the polls show.

In a climate like this, I can think of only three possible explanations for why the presidential e-mail has been so flattering:

- a) The Net is overrun with Democrats.
- b) There's a common belief that flaming the president will result in a pack of Secret Service agents on your ass.
- c) People on the Net are very well informed, and thus can more fully realize what a superb job the president is really doing.

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the unfiltered message," he proclaims, "dieth by the unfiltered message."

Bill Clinton's Net presence began in March 1992, a tumultuous political moment, when the Democratic primaries were getting underway and Ross Perot was beginning to emerge out of nowhere. Eller, then a campaign staffer, began uploading copies of speeches and other Clinton documents to forums on CompuServe and occasionally corresponding with voters. "I was surprised that people took the time to read all that stuff," Eller recalls. Until then, he had underestimated the public's growing dissatisfaction with sound bites and newspaper spin cycles. "People showed a real hunger for longer-form communications."

When Clinton was elected, one of his big themes was to reconnect the people to their government. Part of that was a mandate that all incoming mail be read and that responses be sent out to every letter asking for one. That was a tall order. Within its first three months, the Clinton White House got 3 million pieces of correspondence, more, staffers say, than the Bush administration had received in all of its four years.

By establishing the first Internet addresses to the White House, *president@whitehouse.gov* and *vice.president@whitehouse.gov*, the administration planned to give citizens another way to correspond. In June 1993, the

Within three months, the Clinton White House received more correspondence than the Bush administration had received in four years.

addresses were made public; soon the White House began sending out paper responses to correspondees. In the year after that, the White House received a quarter of a million e-mail messages. On average, the daily e-mail load runs between 10 percent and 15 percent of the volume of paper mail.

White House staffers soon discovered the advantages of e-mail over paper. Whereas paper mail is usually shoved into stacks of boxes, held for six months and discarded, e-

mail is all neatly stored on the White House computer network where staffers can search by keywords such as "health care," "crime," "Persian Gulf," and so on. That enables staffers to instantly measure which issues are foremost on people's minds. Steve Horn says that he is considering CD-ROM as an archive medium. One such disc, he says, can hold a year's worth of presidential e-mail.

A team of five writers has drafted 300 different form letters, expressing the many policies and views of the administration. The White House uses these letters to respond to e-mail correspondents within a week. By contrast, goes the official line, writers of snail mail don't get their response letters for at least four weeks. Unfortunately, in my own little test case, response time proved much more sluggish than promised, and a reply to my e-mail from the White House took no less than a month to reach me.

With the Internet reaching to the far corners of the globe, the day's e-mail brings tidings from abroad. This past February 4, a message from Swedish Prime Minister Carl Bildt became the first e-mail correspondence from one head of government to another:

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From @SEARN.SUNET.SE:ADM CB@HHS.SE Fri
Feb 4 03:52:19 1994 Received: by
WhiteHouse.Gov (5.65/fma/mjr-120691); id
AA13582; Fri, 4 Feb 94 03:52:19 -0500 Date:
Fri, 4 Feb 1994 09:51 +0100 From: Carl Bildt
<ADM CB@HHS.SE> Subject: From PM Carl
Bildt/Sweden to President Clinton To: presi-
dent

Dear Bill,

Apart from testing this connection on the
global Internet system, I want to congratulate
you on your decision to end the trade embar-
go on Vietnam. I am planning to go to Viet-
nam in April and will certainly use the occa-
sion to take up the question of the MIAs...

Sweden is - as you know - one of the lead-
ing countries in the world in the field of
telecommunications, and it is only appropri-
ate that we should be among the first to use
the Internet also for political contacts and
communications around the globe.

Yours,
Carl

Some people have no use for diplomacy,
however, and flame the President instead - to

the fullest extent imaginable. "It's no joke to
threaten someone's life," says Horn. Such
letters, he says, are immediately forwarded to
the Secret Service (see "In Jail for E-mail,"
Wired 2.10, page 33). Sometimes, the agents
will trace the writers back through the Inter-

Technically, there's nothing to prevent White House staffers from establishing an electronic dossier on you, storing your name and views.

net, find out where they live, and pay them a
visit. Many of these purported terrorists have
turned out to be kids joking around.

In addition, there's technically nothing to
prevent White House staffers from establish-
ing an electronic dossier on you. They could
easily extract your name and store it along
with your specific political views in a special
database file. Horn notes, however, that this
database would be forbidden for use by the
president's reelection campaign to, say, solicit

contributions.

The White House e-mail system is only the
start of a much larger Net presence under
development at the White House and at the
MIT Artificial Intelligence Laboratory, which
began working with the Clinton administra-
tion under a pro bono contract and is cur-
rently funded by the Advanced Research
Projects Agency. At the entrance to the AI
Lab's space in Cambridge, Massachusetts, is
a cryptic, new-media poem scrawled on a
white board:

The revelation will not be televangelized.

The revelation will be e-mailed.

The retaliation will be tallied.

The revolution will not go better with Coke.

Doesn't revolution mean going full circle?

No one seems exactly sure who wrote it or
what it means. But the disjointed statements
express a certain subversiveness befitting a
place where a barrel-bodied robot on wheels
roams the halls, bumping into things while
sputtering in a metallic voice: "Don't-follow-
me-I-do-not-know-where-I-am-going."

The prevailing view at the AI Lab is that
control by the mass media over all things
political is coming to an end. In its place will

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be a back-to-basics, Jeffersonian conversation among the citizenry. "It is the opposite of TV blasting stuff out to people's living rooms," says John Mallery, who leads a team of students and researchers setting up an Intelligent Information Infrastructure for which the White House is a test site.

For starters, the MIT team has helped create a White House document server on the World Wide Web (<http://www.whitehouse.gov/>), the portion of the Internet that allows for the display of snappy graphics and multimedia information. The heart of the system is a series of home pages for Cabinet secretaries and other government decision makers.

Top 10 Reasons Why the White House Staff Likes the Internet

10. Surfing the Web is more fun than going to meetings.
9. Even reading old RFCs is more fun than going to meetings.
8. On the Internet, no one knows you're a bureaucrat.
7. It's how we get our daily marching orders from Vint Cerf, Tony Rutkowski, and Dave Farber.
6. It's hard to write your X.400 address on a cocktail napkin.
5. We get all that great electronic fan mail on the Clipper Chip.
4. We have access to the Top Secret Air Force server with cool GIFs of UFOs and little green men.
3. We're still hoping to get on Carl Malamud's "Geek of the Week."
2. We love getting flamed by rabid libertarians on "com-priv."
1. We can send e-mail from *president@whitehouse.gov*.

This list provided by Tom Kalil, the David Letterman of the Clinton/Gore administration.

Jonathan "Jock" Gill, a former Lotus Development Corp. manager who now works in the Office of Media Affairs, is hepped up about using technology to cut through the thick fog of cynicism in America. He believes that the Net can greatly expand the "idea space" in which public discourse happens. Instead of watching a few talking heads on TV, citizens can sit at their computers and engage in two-way conversations with each other and with government officials.

By encouraging the creation of these home pages, Gill's goal is to "give everyone in government a name, a face, and a contact point." The reason the public seems disconnected from government in recent years, he says, is that it has grown beyond the reach of the ordinary citizen. "How do you participate with something you can't find and can't know?" says Gill. "Building relationships this way is conducive to building community."

Mallery's team at the AI Lab has ambitious plans to achieve a vision like Gill's. One effort, says Mallery, is to create a natural-language system that can automatically extract the substance of incoming e-mail and build a representation of the knowledge contained in the texts. These systems might keep track of opinions and discussions within electronic communities – allowing people to find and connect with like-minded individuals around the world. They might also help mediate between viewpoints and move debates toward consensus. A knowledge representation for debates about universal health coverage might include the overall goal and branches leading down that summarize ideas about how to achieve the goal.

In the end, says Mallery, much of human culture will be accessible online, resulting in what he calls a new "electronic *Zeitgeist*." But AI researchers have been working on this kind of knowledge representation problem for nearly 40 years. And there is certainly no guarantee that it will be solved any time soon.

For now, the big question seems to be whether this new forum for political communications really makes a difference. Will we really be participating in self-government? Or will we just be made to *feel* that we have a say in what goes on? To test it, I decided to send some e-mail to the president:

Subj: universal health care
Date: 94-07-11 13:22:19 EDT
From: eis@murrow.tufts.edu
To: president@whitehouse.gov

Dear Mr. President:

I think universal health care is a great idea. I have a comment about how the concept is communicated to the public. A comparison to universal telephone service is appropriate, I believe. It has been conventional wisdom for decades that phone companies offer universal service. Yet only between 90 and 95 percent of people in the US have telephones. The others choose not to have service, even

though the industry's cost-averaging policies make it affordable to virtually everyone.

Seems to me health care will be the same way. We will never have 100 percent coverage. At best it will likely be in the mid-90 percent range, I would think.

You probably have two choices. Accept the congressional plans that promise 95 percent coverage, and "call it" universal, pointing to the phone companies. Or you can say that universal service – meaning 100 percent – was unrealistic to begin with, given the experience with the phone industry.

I believe this is an appropriate parallel that you should look into.

Sincerely,
Evan Schwartz
Boston, Mass.

Less than a week later, presumably after my e-mail made its way up to the eyes of the president himself, this story lead appeared on the front page of *The New York Times*:

BOSTON – Suggesting that he is ready for compromise on health care legislation, President Clinton on Tuesday softened his call for insurance coverage for all Americans, saying 95 percent or 98 percent might do. "We know we're not going to get right at 100 percent," Clinton said.

Then, this from The Associated Press the following day:

The President felt the need to clarify his position after he told the governors conference in Boston Tuesday that "we know we're not going to get right at 100 percent." Clinton told reporters he could compromise on how to achieve 100-percent coverage, but that numbers like 95 percent or 98 percent that he tossed out a day earlier only reflected congressional negotiations and practical realities – not a reduced goal.

Until this moment, Clinton never addressed the issue of what "universal coverage" really meant, in terms of a percentage. I'm under the impression that my e-mail may have helped convince Clinton to get more realistic about his health care policy. I'm going to have to start writing that guy more often. ■ ■ ■

Evan I. Schwartz (eis@murrow.tufts.edu) is a research fellow at the Edward R. Murrow Center for International Communications at Tufts University.

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Toon Town

If Brian Boigon has his way, cartoon-filled *Spillville* will be one of the first cities on the infobahn.

Or at least the 1995 television schedule.

Interview by Douglas Cooper

According to Brian Boigon, the best way to zip down the information highway is in a cartoon. This isn't just a bad pun: it's an idea that's generating serious interest in both New York and Hollywood, and it's the subject of intense discussion in meetings with Lorne Michaels's

these forces. He's neither a media mogul nor a technophile, but a serious intellectual iconoclast who wears many odd hats: he's a professor of architecture, an artist and novelist, and the North American correspondent for a Tokyo-based think tank called Urban Design Research Inc. UDR addresses problems that will face the 21st-century city, and in a sense, this is what Boigon is best at: solving traffic problems on roads that don't yet exist.

Boigon doesn't look much like a professor. His habitual uniform is a parody of the Bob and Doug Mackenzie school of Canadian couture: baseball cap, down vest, rolled-up Levi's, heavy woolen socks. And he wore this stuff long before grunge slithered onto the market. The Boigon look is not about style; it's about the archival preservation of vintage suburban Canadiana.

And Boigon's conversational patterns are scary – a rapid-fire stream of consciousness that owes equal parts to Jacques Derrida, Lenny Bruce, and Mike Myers. He mixes metaphors indiscriminately, and he seems unwilling to distinguish between the high and the low, routinely dragging high culture through the mud and elevating mud to the status of art. His universe seems to move at about the same pace as Roger Rabbit's. Recently, Doug Cooper caught up with Brian Boigon at his studio in Toronto.

Wired: What specifically is it about the cartoon that lends itself to cyberspace?

Boigon: Well, the basic properties of cartoons have everything to do with motion – moving through space, dynamic systems, relating huge pieces of information in short pieces of time – everything that computers would like to be able to do: compress information and redistribute it quickly.

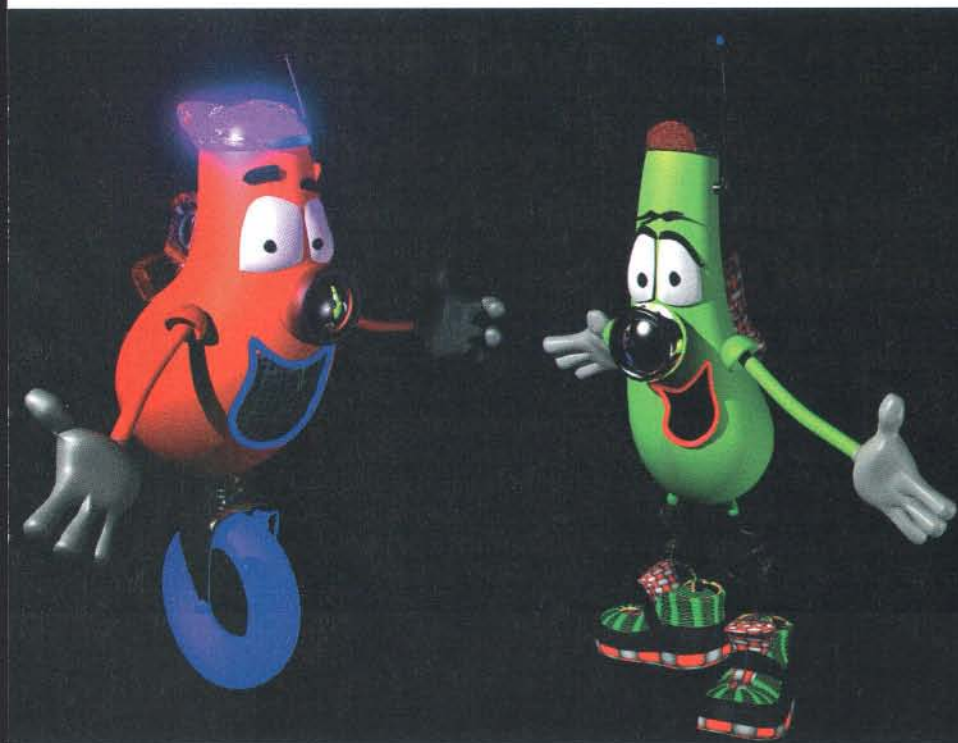
Cartoon animation conveys incredible amounts of information in very short periods of time. Take a Warner Bros. chase scene – Bugs Bunny and Elmer Fudd. In mere seconds, you get an entire war – the strategy, the attack, the retreat, the recapitulation. The whole military-industrial complex is reduced to a bunny and a stuttering guy zipping across the landscape. This attribute of cartoon animation – the ability to convey a lot of information in a short period of time – is based on the idea of caricature: you exaggerate prominent features of a face or body to convey its true essence. That's why you can glance at a

Cartoons like Rom and Ram relate huge pieces of information in short pieces of time – everything that computers should be able to do.

Broadway Video and the William Morris Agency.

Boigon's outfit, BB Studios, has just signed a contract with Broadway Video to develop *Spillville*, the world's first interactive cartoon for television. The demo's ready, and the pilot should be completed by the end of 1994. To work on the project, BB Studios has brought together some of the biggest players in the increasingly overlapping worlds of advanced technology and mass entertainment. Boigon's partner is Stephen Bingham, the founder of Alias Research, which pioneered morphing. The animation company is Core Digital, William Shatner's special effects outfit. And the co-production house, Broadway Video, is a division of Paramount headed up by Lorne Michaels, who brought us *Saturday Night Live* and *The Kids in the Hall*.


Boigon himself is an odd guy to be at the confluence of





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In Boigon's world,
a cartoon agent does the bidding of a teenager on the Internet:
it retrieves and sends video mail, it finds stuff in libraries,
it pirates and samples sound bites.

single still shot of, say, a cartoon rooster, and you already know his personality – he's arrogant, blustering, larger than life.... In short, Foghorn Leghorn.

You're a professional artist and an architect as well as a teacher. When someone like you enters the cartoon world, we can expect something a bit deeper than *The Flintstones*, something more dense and provocative than Wile E. Coyote. You've chosen to make a cartoon, but I take it we're looking at something far more ambitious than just another typical animation series for TV.

Actually, *The Flintstones* is profound – think of Fred, the primitive modern. And the Road Runner is an important experiment in three-dimensional modeling – perspective

without a vanishing point.

Right. But why specifically the cartoon? You're pretty well known in the design community; for years you've been perched on the edge of cyberspace, wondering about the problems of creating form in virtual space. Why did you decide on the cartoon as a way into that world?

Built into my cartoon is a software concept. You may have heard of "agent-based software," or "valet software." It's a concept being investigated by Apple, Magic Cap, and MIT Media Lab, among others. My cartoons are going to be agents. You'll have your own personal cartoon, and you'll be able to manipulate it in cyberspace.

How? What separates your cartoon agents from the more conventional notions of

agent software? Agents by General Magic are graphical secretaries that go out, search databases, and retrieve your phone voicemail; they do practical, useful things. What does a cartoon agent do?

Well, to begin with, it does the bidding of a teenager on the Internet: it retrieves and sends video mail; it'll search and find stuff in the libraries and video stores; it's capable of pirating and sampling sound and image bites. Cartoon agents are like personal, roving editing suites or recording studios. And they have personalities, full-blown personalities. You'll *like* them. What I'm really designing is a landscape, a complex urban space. A city called Spillville. Spill is one of the first cities on the information highway.

Tell me about Spillville. Is the medium

the ultimate surround sound

Life is stressful. You could spend a few thousand dollars rushing to a weekend getaway at a rejuvenating retreat. You could mortgage your home for one of those "quiet as a recording studio" motor cars you've seen on television. Or you can keep the family fortune and relax in the sanctity of your own home with a pair of Sennheiser headphones. Discover the ultimate in surround sound... at a budget you can easily afford.

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Kids can become citizens of Spillville even now.

**You can send in a videotape of your birthday party,
and it might show up in a couple of weeks
as background for a cartoon adventure.**

ready? The television we have today is hardly interactive.

You're right. It's not quite ready for full interactivity. But it will be. And we'll be in a position to take advantage of it.

Kind of like Xerox – the company that developed a graphical interface for the personal computer back in the 1970s before anybody really owned a personal computer.

Right. Except that, unlike Xerox, we're going to maintain the rights to the things we've developed.

Do we have to wait until TVs are interactive? When's this cartoon ready to air?

No, no. We're ready, whenever the networks pick it up. It's going to be sold to the major international networks, just like any TV

show; we're looking at March '95 to begin the series. We're designing the cartoon as if it were fully interactive, even though, for now, it's an illusion. Kids will be able to contribute to the show, but not in real time. And when TV goes fully interactive, people will already be familiar with the concepts from watching the first phase of the cartoon.

What will I need to get involved? Do I need a modem, a PC, a Cray?

To begin with, you'll need a TV and a telephone and, if you have one, a video camera. That way you can send your own footage into the show, and it'll be scanned as content. Kids can become citizens of Spillville even now. You can send in a videotape of your birthday party or send your own drawing, and it might show up in a couple of weeks as

the background for a cartoon adventure. This is the illusion: it's a form of delayed interactivity. And this will be available immediately. Kids will also be able to register for a voice-mail box, located in Spillville. You're familiar with companion ads in newspapers, where you can leave voicemail for prospective dates?

Right. But surely this won't show up on the screen, as part of the cartoon.

No, but it's part of the culture of Spillville.

You become a citizen; you have services.

Within six months, there will be video voice-mail boxes – SpillBoxes – placed in shopping malls. They'll be like telephone booths; kids can go in and record stuff that will be sent to Spillville and used as background.

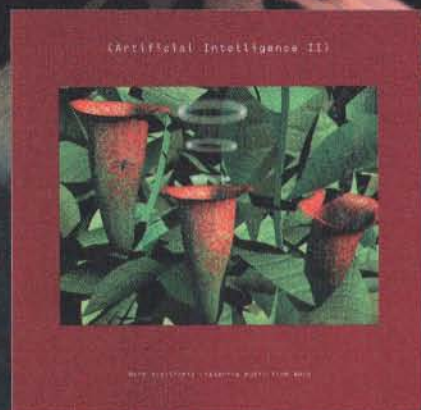
How much is all this going to cost a kid?



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ELECTROSPHERE



Cola is a real life 13-year-old girl who uses cartoons as agents in Spillville.

Well, TV is free, of course, but all the other gear – SpillGear – will cost money. I can't give you exact prices, but it won't be any more expensive than a skateboard. The investment certainly won't be any greater than a gamebox, like Nintendo or Sega. **So kids can buy into this with their own pocket money. And when you do get your own personal agent, do you get to choose what it looks like, or do you have to choose from a cast of predesigned characters?**

It's exactly like the car industry. The average user will buy a stock model, with stock options; a more adventurous sort will buy a sporty model; the more technologically inclined will customize.

You mean, if I knew what I was doing, I could build my own agent?

Yes, you'd trade stock parts, bring in your own bits. The kind of kid who builds hot rods will do this. The kind of kid who's a combination of computer nerd and car nerd will get a real kick out of Spill.

And down the road? Am I going to need expensive equipment to take advantage of the more complex interactive functions?

What you'll need will be there, as an everyday appliance, in every home. There are two arguments as to what it's going to look like. Some people say the TV is going to become a

telecomputer; that's what George Gilder insists in his book *Life After Television*. Others say that the computer's going to become more of a TV. I happen to be in the first camp. But either way, we'll be ready. **So when the TV evolves, and people upgrade their gear, everybody will have the necessary equipment to tune into Spillville.**

Exactly. The first TVs couldn't receive color, for instance – but the consumer product evolved with the software. The TV will continue to evolve and have new capabilities each year, like the car. As TVs become more capable, our cartoon programming will become more and more sophisticated and more interactive with our audience. What's unique about the *Spillville* series is that we developed a strategy for making the cartoon fully interactive when the technology becomes available.

So you're gambling that in the future, TV watchers will be buying their own personal cartoon agents from BB Studios, to act, in a sense, as robots, agents in cyberspace.

The robot's a good analogy. Cartoons are kind of monobots: they do one thing only, and they do it well. The Road Runner escapes. The Coyote self-destructs. I began to look at the cartoon as a way of moving in and out of

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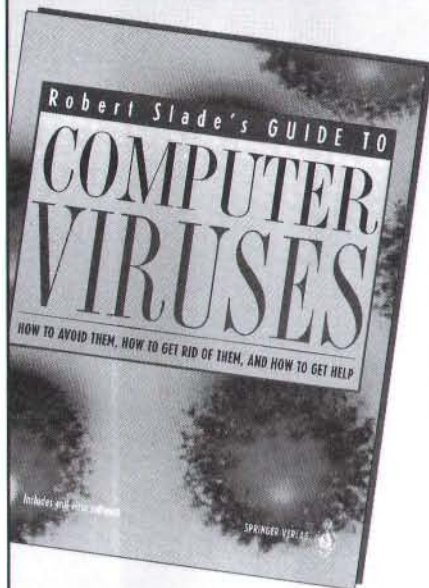
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cyberspace; it was a way of navigating this space that didn't involve goggles and gloves and helmets. Hence the idea of agents, which can do your bidding in this other world. Agents act on your behalf — they're probes.

This is the sort of thing Bruce Sterling has been advocating. Sending out a probe to search a database, grab a video, or download an album is cheap and fast. In my case, it's a question of giving the user a new way of moving through space that doesn't involve tying down your body. Your probe will act on your behalf; you can sit at home, and it will move for you.

The telephone, for instance, freed up the body in this way, gave it another feature — you didn't have to walk down the block to Aunt Mabel's; you could just dial her up. On the other hand, you didn't have to strap your head to the telephone. I see the cartoon as a car, the first car on the information highway.

Isn't that still taking the notion of "highway" a little bit too literally?

Why not? Why not take it literally? You have that option, as long as you keep in mind that you're not just designing the highway, but the urban landscape that floats along beside it. With so-called cyberspace, you're dealing with this fiction, a projection of an environment that really doesn't exist. Everybody would like to see it exist, but it doesn't. Cyberspace has no inherent form. Its shape comes through metaphor.

And your preferred metaphor comes straight out of Kerouac, or maybe *Easy Rider*: the open road. It's very American. It's very Canadian. Canada's a big country, and there's a sense of vastness here that I'm not sure exists in the US. The pioneer cyber-vehicles were the aboriginal canoe and the European rail, devices adapted to get the Canadian colonizing machine from point A to point B. It's important to get the metaphor right, and I think "information highway" is almost the right metaphor.

Actually, I prefer to think of it as a river. In my cartoon, it's called the Nile. River banks are like databanks; they collect information — silt. The Nile is the Great Collector. Rivers evolve, they meander; they're far richer than highways.

If you look at the electronic field as a space in itself, there are only a few genres that have gained any momentum in terms of giving that field form. One is the genre of the paper

office, which Apple rightly appropriated in creating its basic desktop interface — the file folder, the pencil crayon. And the other principal genre is the cartoon. Videogames, post-pinball technologies, build very much on work done by the studios — Disney and Warner Brothers in the '20s and '30s — which I've been studying in some depth. It's fascinating. Remember the rural landscape of Warner Bros.' *Bugs Bunny Show*? Well, Spillville is a three-dimensional place, somewhat similar to that.

What do you mean by 3-D? How can a television give us three dimensions?

Spill is an actual place. Unlike the cell animation of *Bugs Bunny*, the landscape of Spill will persist through time. Your agents can move in and around objects, can live there. Think of e-mail: it doesn't disappear when you turn off your computer. Spill is a rural town, the size of Mayberry or Bedrock.

As TVs become more capable, our cartoon programming will become more and more sophisticated and interactive.

So when I'm sleeping and my TV is turned off, Spillville will continue to have a life; it will carry on in my absence.

That's right. Another difference between Spill and Mayberry is that my city's a bit chaotic, like a real city. A bit gritty. We're going to put some dirt into this cartoon. My cartoon is computer generated, but it's not obsessed with that fact. In the digital domain, you're always coming across this obsession with the clean, dry, and high — as opposed to the shit, dirt, and dust of the analog. The digital mentality is very neurotic about cleaning up reproduction.

Reproduction should look more like sex. It's messy. You talked about the paper office that Apple appropriated to create its desktop: with Spill you're dramatizing the trash can in the corner? Unfolding the mysteries of the Apple trash can?

Exactly. And children know the value of excremental culture. They know the value of the dirty, of the profane. And this is what makes comedy. Let's face it — shit's funny. (Laughs.) Shit happens, and it's funny. Children are less inclined to gloss over the unpleasant aspects of life: they're fully engaged. OK, so we have a city called Spill, and a number of people live there. I have two main cartoon characters, Rom and Ram. They're pranksters.



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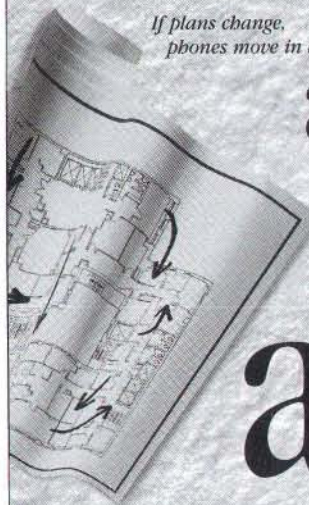
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Cola lives in a loft built above her parents' cars in their suburban garage. She spends a lot of time screaming at her cartoon valets, Rom and Ram.

Let's talk about these names, Rom and Ram. On the one hand, they're supposed to be simple and ridiculous — like the Flintstones — on the other, I take it there's some deeper association.

There's a relationship to Romulus and Remus, the mythical brothers whose little spat gave rise to the Roman Empire. Romulus dug the first ditch on which the foundation of Rome was built, and Remus ridiculed this ditch, so Romulus killed him. Romulus and Remus play this interesting role, you see, as the combative brothers who give rise to urbanism.

Also, of course, these are clearly names from the everyday world of computing.

Read Only Memory and Random Access Memory are two basic terms for various attributes of technological memory-based systems, both software and hardware. But that's not all. There's R and R: not only Rom and Ram, but rock and roll, rest and relaxation. We're playing with this idea of R and R as this thing which moves from high to low, from pop to sci-fi.

Only I don't have to know any of this to enjoy the cartoon or to use one of these guys as an agent.

Not at all. It's just there, in the structure of

things. You probably don't know how your word processor really works, but you know how to use it.

Now, Rom and Ram live in a forest. There are two forests in Spill: There's the Dim Sum Forest, which consists of image-bank trees; and there's the Karaoke Forest, where the vegetation consists of a bunch of sound samples. Rom and Ram are plugged into the Dim Sum Forest.

It sounds like fun, but what the hell is an image-bank tree?

It's a storage device for images. It's a TV and a VCR rolled into one, and it looks like a tree. Rom and Ram and other cartoon agents use the trees; they watch them like TVs. And there's the Spill Farm, which is an image-sampling farm. The Spill Farm is an editing facility, where images are brought in by Rom and Ram, and others, to be cultivated, edited. And then there's a whole other area for games and entertainment, a sort of recreational theme park.

It's a bit silly.

I hope so. We're hoping to appeal to the teen market, ages 10 to 14. Then we'll bridge into young adults. But silly is important. The city has a mountain in the middle of it, known as Spill Mountain; and on Spill Mountain lives

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Here they come

the infamous wizard, Dr. D. Igitel. Dr. D polices the city, using TV 'copters to make sure that Rom and Ram and others keep in line. The information highway runs right through the center of Spill; as I said, it's called the Nile.

I can begin to see the drama here: a battle between the fascists and the hackers. Dr. D versus the pranksters. But what about interactivity?

Rom and Ram are agents, they're valets, they do the bidding of two live-action characters called Cola and Amigo. You'll see these guys on the screen as well; but they're not cartoons, they're real teenagers. Remember Max Headroom? How he interacted with real people? Or *Roger Rabbit*, *Cool World*? In these films, real filmic images shared space and interacted with cartoon characters. Cola and Amigo are not sitting in front of computer terminals; they're in a room, screaming at Rom and Ram.

Cola is a 15-year-old girl – a real girl – who lives in a loft built above her parents' cars in their suburban garage. Amigo's a teeny-bopper rock star who lives in an RV. His parents rip him off; they take all the money he makes

performing, and they live in nice hotels and drive a 1978 white El Dorado. Amigo lives in his RV in the underground parking garage beneath whatever hotel his parents are staying in. Amigo's last name is Cocktail – Amigo Cocktail. These two are pretty representative of youth culture, which in my mind is made up of music, movies, and premarital sex.

Actually, speaking of music, we've just signed Mark Mothersbaugh to do all the music. To score the animation and write the theme song. Remember Devo? Mark Mothersbaugh invented Devo; he was the founder. **I was a big fan. I've always wondered where those guys disappeared to.**

They're in Spillville. We gave them an apartment, rent free. I see it taking five years for the telecommunication networks and cable companies to refine a two-way video-on-demand system. And five more years to make television hardware receptive enough not to get in the way of real time interactivity: Roseanne and your kid have to be able to interact in real time.

I don't have a kid.

But by the time you do, she'll be able to dance with Roseanne Arnold. And by that time,

Spillville will be completely interactive. Finally, Spill will become a city for the users. Rom and Ram will not be the only agents sleeping in the Dim Sum Forest, but yours will be as well.

So when you subscribe to Spill – the way you would subscribe to an online service – you will become a citizen of Spill. And Spill will act as a city in which you get certain services, but you will also be able to act and contribute to the cartoon through your personal valet.

You won't have to be highly techno-literate to get involved: you need to know how to watch TV. If you can watch TV and punch a phone number into a phone, you can play. If you told people a hundred years ago that they'd each own a car, they would have laughed at you. I'm telling you, in 10 years, everybody will own a cartoon. ■ ■ ■

Douglas Cooper's first novel, Amnesia, was published this year by Hyperion. He is currently collaborating with architects Diller + Scofidio on a VR installation for the Pompidou Center in Paris and with Peter Eisenman on a project for the Milan Triennial.



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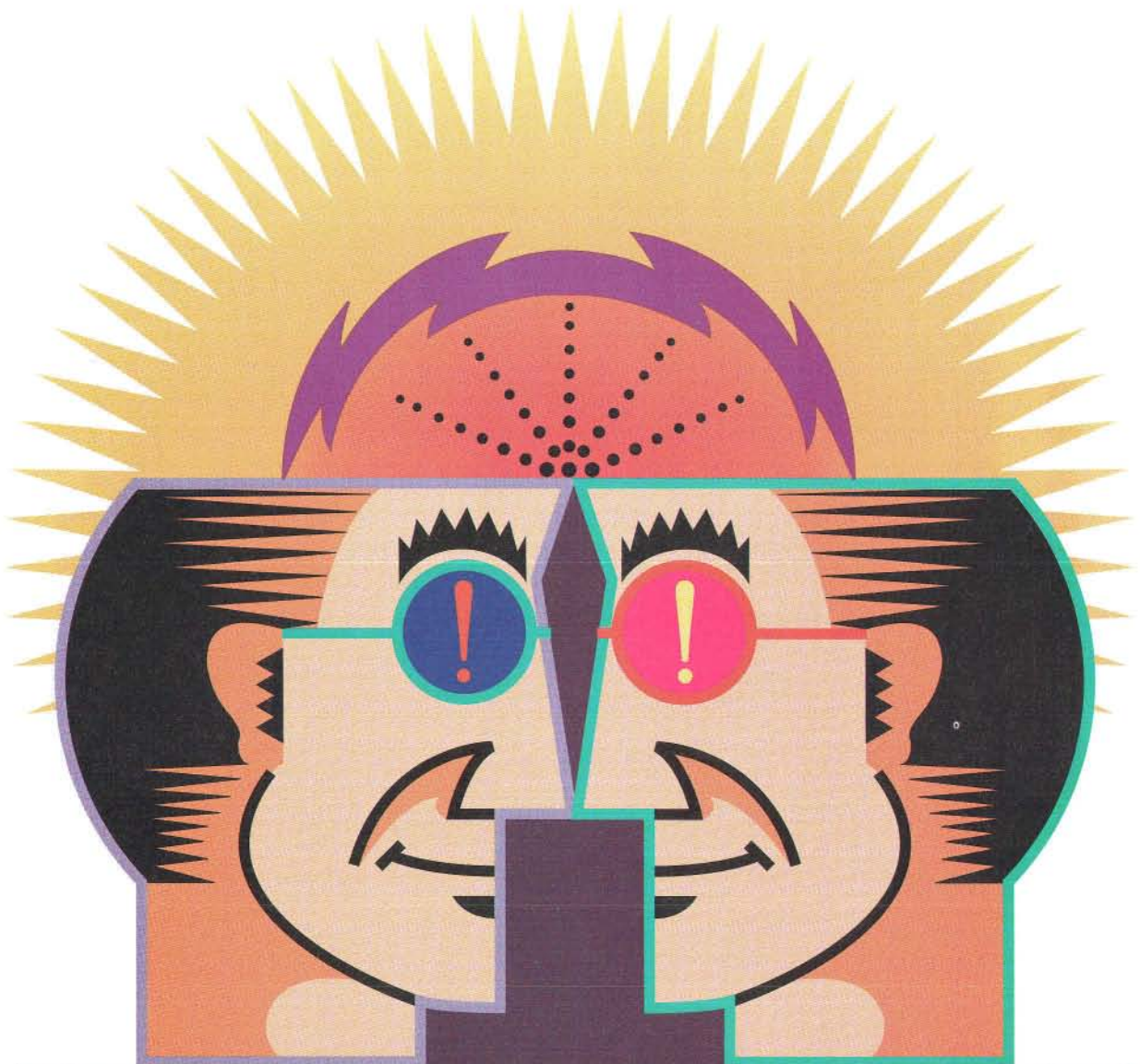
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By A.J.S. Rayl



All clear and ready." Bob Lazar's voice echoes through several hand-held radios.

A hush falls on the crowd of people gathered on one side of this barren, dry lake bed in the middle of Absolutely Nowhere, Nevada. The sun slides behind the

mountains and all eyes train on a smoldering pile way out in the distance. Feathers of gray smoke silently snake their way up into the sky.

"She's goin'!"

Jim Tagliani bellows.

"Awe-some!"

"Holy shit!"

Seconds later, a deafening explosion cracks the silence of the desert at dusk. Tiny plumes

mushroom into a massive furling cloud of black smoke. Red hot flames seethe at the cloud's core. From the outer edges, minute, strobe-like particles fly out and die down on the parched mud floor.

Thummmmbpff! From a launching tube on another part of the lake crater, a shell soars high up into the air and bursts into an array of magenta and glitter that sparkles up the sky. "Whoooo-hoooo!" Laura Godel is exuberant. "That's beautiful," chimes in Linda Wilson.

Meanwhile, Jim Tagliani has strapped a moaning, flame-throwing static Ramjet to his back and is zipping by the crowd on roller skates. In another part of this parched mud arena, Lew Godel takes his position, belly down, face to the dirt, and hits a launch button. A stealth-black rocket emblazoned with the letters D-E-S-E-R-T B-L-A-S-T lifts off and soars up to Mach 1. It may be soaring still.

There's a time and place for everything in this petrochemical world in which we live. There's a time to reap

and a time to sow. A time to take massive amounts of bullshit, and a time to vent it all and party down in a gaseous, dynamite celebration of independence. On this particular evening in May, it's time to vent.

Every year since 1987, on a secret date and at a secret location, a group of pyrotechnics wizards stage an annual outlaw gathering out in the desert outback of Nevada. In 1991, patriotically inspired by Desert Storm, the organizers dubbed the event Desert Blast. The group's unwritten code: Bigger and Better Fun through Chemistry and Physics.

"Desert Blast is a celebration of the things an American should be able to do," explains one veteran, who requested anonymity. "And it's about forgetting and having fun, kind of like, Let's go be a kid again."

"Yeah," echoes another attendee, "and not have *anyone* tell you to shut up!"

Humbly billed as "the largest outlaw fireworks show in the West," Desert Blast is probably the largest outlaw fireworks show in the *world*. The actual detonation date changes from year to year, as does the location. It's an exclusive affair. As the video invites proclaim: "If you don't know where it is, you're not invited." But for those who are honored with an invitation or those who know somebody who knows somebody who has directions, Desert Blast – or DB, as regulars call it – is the party to end all parties, a party that gives you a place to rant and something to really rave about. In essence it's a night of contained anarchy. The Woodstock of Pyrotechnics.

Desert Blast is the brainchild of Bob Lazar – by day a freelance scientist and businessman – and Jim Tagliani, who pays the bills by installing and programming computers for Indian bingo parlors. As one DB adage goes: Bob builds it; Jim tries it out.

For Lazar, the flame for fireworks was kindled during his youth on Long Island, New York. He spent his summers hanging around several local families who made professional fireworks. "Because I was young, they wouldn't let me touch anything flammable," he remembers. "But I would help tie strings and stuff." Years later, Lazar decided to figure it out for himself.

Lazar's affinity for things pyro slept, latent for nearly two decades of school and work, but in the early '80s, he hooked up with Tagliani, a natural-born daredevil and



"Desert Blast is a celebration of the things an American should be able to do," says one veteran. "It's about forgetting and having fun."

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neighbor in Woodland Hills, California. It was an instant affinity: both were blinded by science. Lazar was working at Fairchild Xicom, he says, a now-defunct electronics firm, when he recommended Tagliani for a technician position there, and the friendship grew. Later, driving through LA one day, the two passed an acquaintance waving a pyrotechnics device. The guy invited them to a gathering of motorcycle freaks being held in a dry lake bed out near El Mirage, California. There, says Lazar, biker pyrotechnicians hosted an explosive fire fest, until their fun was eventually quashed by Bureau of

istry, physics, and electronics, they came from all walks of life and all kinds of day jobs. NASA controllers and electronics specialists. Computer programmers and technicians. Propulsion systems experts and car mechanics. Even real estate appraisers and contractors. Together, they formed the core creation team of Desert Blast.

It takes at least three months and close to US\$6,000 to manufacture all of the festive accouterments for the one-night show. "It really is a team effort," says Lazar. "And now there are pyrotechnics conventions that we attend." During the year, the pyro-cohorts

1990, Lazar and Tagliani had learned one thing: if you launch it, fire it, or blow it up, they will come. Hundreds of uninvited spectators appeared from far and wide to witness the show. In 1992, the assemblage swelled to more than 450 people. "And sometimes they'd review the show; give us *shit* if something wasn't exactly perfect," recalls Gene Huff, who appraises real estate when he's not mixing chemicals and rolling stars.

"It was starting to get out of hand," Lazar sighs.

Lazar's notoriety in the UFO underground no doubt had a lot to do with that. In March 1989, Lazar, fearing for his life, publicly claimed, on KLAS-TV, the Las Vegas CBS affiliate, that he had just been released from a top-secret program, Project Galileo, in which he helped back-engineer the propulsion system of one of nine extraterrestrial craft being stored on the Nellis Gunnery and Bombing Range in Nevada. Overwhelmed with requests for interviews, which he "loathes," plagued with "tons of mail," and adamant about not joining the "crazies" on the UFO or talk-show circuit, Lazar quelled the deluge by producing, with Huff, a videotape about his alleged experience, something that has made him a veritable icon in the UFO haunts of cyberspace.

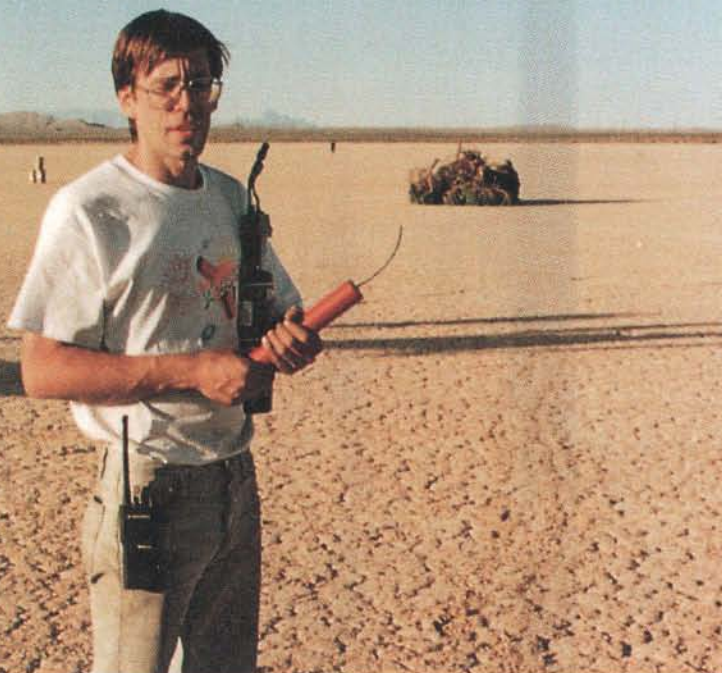
But that is another story. Commandment Number One at Desert Blast: Thou shalt not talk of UFOs. Nevertheless, "Excerpts From The Government Bible" (otherwise known as the Lazar Tape) has made Lazar a popular guy and someone a whole lot of people want to hang with.

For the last two years, Lazar has diligently faxed out wrong directions and dates to lose a few of the uninvited guests and general pains in the ass, not to mention unwanted law-enforcement types. Desert Blast does not exactly conform to federal regulations.

"Actually, while we were out testing some shells one day, a cop did show up," says Lazar. "He saw what we were doing and just said, 'Cool. Mind if I watch?'"

On Saturday, May 21, the Desert Blast countdown digital clock ticks down to 0:00 at the secret rendezvous location, and final loading begins. Everything has already been packed for transport: More than 400 shells; a single display cart of 100 2 1/2-inch star shells and reports; the giant, double-pinwheel display; bunches of small black-powder rockets with titanium and reports; strobe rockets; various sizes of salutes (including several M-800s); six stealth-black rockets, complete with nose

The guys who
run Desert
Blast, you
might say,
are like Beavis
and Butt-head
armed with
a knowledge
of chemistry
and physics.



Land Management officers.

According to Lazar's account, he later moved on to Los Alamos National Laboratories in New Mexico, but like many a bomb-crazed scientist, he felt stifled there. So in 1985, he headed for Las Vegas, Nevada. Not long after, Tagliani joined him in the City of Sin. The fireworks flame re-ignited in Lazar and Tagliani, and so they decided to uncover the secrets of pyrotechnics, and put one of Nevada's numerous dry lake beds to use. Their first two desert shows were small, drawing 50 to 75 friends. Lazar personally manufactured all of the fireworks.

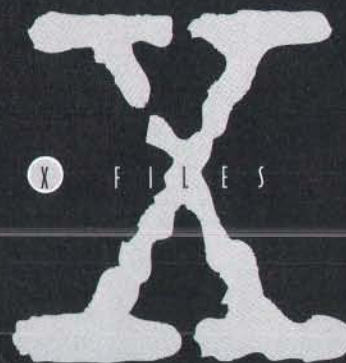
But as the two attempted to outdo their work each successive year, planning and executing their private parties became a time-consuming task. In 1988, Lazar enlisted a troop of capable friends. United by chem-

istry, physics, and electronics, they came from all walks of life and all kinds of day jobs. NASA controllers and electronics specialists. Computer programmers and technicians. Propulsion systems experts and car mechanics. Even real estate appraisers and contractors. Together, they formed the core creation team of Desert Blast.

As the time nears each year, Linda (aka Crouton) Wilson, Lazar's girlfriend of four years, serves as Desert Blast's assistant coordinator. Laura Godel helps Lazar finesse the electronic devices, while her husband, Lew Godel joins Lazar in the creation and supervision of all rocketry. Dan Stegemann serves as general device assembler, while Shelly Ball, Tagliani's girlfriend, manufactures Teddy, the sacrificial bear whose destruction marks the event's climax.

Word about Desert Blast spread quickly. By

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cones and tails; four large barrels of magnesium; 20 gallons of fuel for the gas bombs; propane torches; launching tubes; boxes of extra fuse and wiring; five weather balloons; hardware; a viewing tower made from steel scaffolding; a sound system; boxes of Day-Glo Cyalume sticks and rope; coolers packed with food and water; cameras; and various other items. At around 2:30 p.m., a caravan of some 20 cars, trucks, trailers, and recreational vehicles leaves the highway and begins winding its way through desert terrain down an unmarked dirt road and onto this year's

facing the wrong direction. As he rolls in for a pit stop, the afterburner flame swells and shoots out. "Hey! He's on fire!" shouts an uninitiated spectator.

Not to worry. Onto bigger things. It's Super-Bomb time. Materials are placed, and the announcement is made. Within seconds, another deafening explosion shatters the earth, this one erupting into an ominous, deep-black, almost-mushroom cloud, and has the crowd on its feet, cheering maniacally. Over on the highway, several miles away, traffic has stopped, and spectators watch in a

As night falls, an intermittent stream of cars makes its way down the unmarked road to witness the show, and soon onlookers drape themselves in Day-Glo. It's time for the day's peak, the ultimate fireworks display.

Out at the launching area, youthful newcomer, Jeff Carbary, assumes the task of overseeing the mortars and the main fireworks begin. Before launch, Carbary details the make of each shell for the benefit of the pyro connoisseurs, the gathered crowd of Those Fascinated by Fire. One after another, the fireworks burst in full radiance against the sky, and the audience murmurs its appreciation in hushed and almost reverent ooohhhs and aaahhhs.

Finally, it's time to blow up Teddy, a tradition at Desert Blast. Teddy originally came from Tagliani's home Halloween yard art. He and Ball initially decided to take Teddy to DB as a sort of mascot. "At first, we used to let him just hang around," recalls Shelly Ball. "But, we needed a goal - something to destroy, and we realized, 'Hey, we can shoot Teddy.'" So, Teddy quickly became a target, replacing the Saddam Hussein paper targets on the shooting range. "We'd put beer bottles or Coke cans in his pockets; then we graduated to M-80s, then M-800s," says Ball. "It was a challenge to see who could shoot his pockets first. Ultimately, we'd blow his arms off, then maybe a leg or two. But Teddy was still left, more or less."

The next year, they decided instead to just put Teddy on a Coors Party Ball gas bomb and blow him to bits. That approach, or a similar concept, has stuck.

As the sun rises over the mountains, it's cleanup time for Lazar and Tagliani and the rest of the core DB team. They rise, scouring the desert for any remaining debris, bagging it for disposal. All the escaped dirt is shoveled back into the holes, and the dry lake bed is restored to its original condition. By 10 a.m., all tents have been dismantled and all waste discreetly stored in the back of trucks or car trunks. There are virtually no signs that anything unusual took place here - no signs that just hours before, nearly 200 people had gathered for a night of living dangerously. As the sun begins to bake the valley, the DB caravan heads out, back to civilization for another year. ■ ■ ■

A.J.S. Rayl (ajsrayl@aol.com) is currently finishing work on a CD-ROM about the search for extraterrestrial intelligence for The Voyager Company. She has also written for Omni, People, and Rolling Stone.



"While we were out testing shells one day, a cop showed up. He said, 'Cool. Mind if I watch?'"

chosen dry lake bed. There, they stagger into a parking line that stretches out along one side, and everyone begins to set up camp.

At center stage, on the lake crater, the first mortar is launched. It soars more than 800 feet into the sky. As it bursts, an American flag on a tiny parachute patriotically unfurls and flaps across the desert on the air currents. DB VIII has begun.

At around 4:30 p.m., Lazar fuels up the Jetcar, dons his fire-retardant jacket and crash helmet, and climbs in. The Jetcar, like your basic dragsters, is comprised of a chromoly steel frame. It's about 32-feet long and its jet engine - originally designed for the Navy's first supersonic fighter - makes the car look not so much futuristic as absurd. A 30-foot flame shoots out the back and the shrill, decibel-defying noise makes you feel as if you've been stranded out on an Air Force tarmac

state of awe or disbelief. Maybe they think they're watching some sort of weird military experiment. But the Desert Blast participants aren't self-conscious. "There is just nothing more exciting than totally blowing something up - and then feeling the shock wave go through you," says Farhat. "You can just stand and watch ... and you feel like you've screamed. It's weird. Really weird. But it feels so good."

Out on the rocket pad, Lazar and Lew (aka The Viking) Godel are preparing the test launch. Godel is the sort who enjoys living wildly. "This is a unique guy," Lazar explains, as Godel hunkers down on the ground near the 5-foot-tall stealth-black rocket that stands majestically against the backdrop of the desert. "He killed a deer once, and then spread the blood all over himself, or whatever it is the Vikings do. Then he took the heart out and ate it."

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Ask the renegade codesters at OSC.

By Michael Goldberg

Wow! See that guy over there!"

Walking down the street was a tall man with a stylish haircut and the obligatory black, South-of-Market clothing. I might have been witnessing a rock-star sight-

ing by an excited fan. Only, the awestruck speaker was a rock star himself: Jimmy Wilsey. At the time (1991) he was in Chris Isaak's band and the creator of the memorable guitar intro to the international hit "Wicked Game."

The man he was pointing at wasn't a rock star at all, but rather, the co-owner of a small software company on his way to the MACWORLD Expo in San Francisco.

"He's one of the guys who created Deck," explained Wilsey. "He's a heavy dude."

Wilsey and other musicians, both well-known and obscure, have good reason to be impressed. A year earlier, in the summer of 1990, "heavy dude" Josh Rosen and his two partners, programmers Mats Myrberg and John Dalton, formed a company named OSC. Working in concert with Digidesign, a fast-growing developer of digital audio technology, OSC (which stands for Our Stinking Corporation) was primarily responsible for making Mac-based multitrack digital recording possible for the average musician. Earlier this year, the company made it even easier to record with a Mac, releasing Deck II version 2.1, which can turn a Macintosh Quadra 840av (no additional cards or add-on black boxes needed!) into an 8-track digital-recording studio. Cost of the program? Less than US\$400.

Everyone knows about the phenomenon of desktop publishing. But desktop *recording* is just now becoming

affordable and widespread. Using Deck, the original 4-track version of the program, San Francisco's radical art-rock group, the Residents, recorded *Freak Show*. Deck has also been used by music industry professionals like Columbia Records VP and producer David Kahne (best known for his hits with the Bangles).

Until OSC wrote Deck, multitrack digital recording was not possible on a desktop computer. Digital recording (as well as professional analog recording) had to take place in \$200-an-hour recording studios, using costly dedicated multitrack tape recorders. To create a finished master, most artists build a recording track-by-track, with musicians first laying down bass, drums, and rhythm guitar, then adding guitar solos, vocals, keyboards, and whatever else is needed. Because each instrument is on a separate track, when a performance isn't perfect (or if the musician comes up with a new idea) that part of the original recording can be erased and then rerecorded. Stars like Stevie Wonder, Prince, and Trent Reznor have been known to record all the tracks of entire songs – and even albums themselves – through the use of multitrack recording technology.

The introduction of Deck by OSC has changed things. The average musically inclined and financially strapped propeller-head (not just the rock star with a big budget) is truly benefiting from the new software. That's just what the owners of OSC intend.

"Just a year and a half ago, we got calls mostly from more sophisticated people who had grown up with computers," said Rosen one afternoon over drinks at The Slow Club, a San Francisco restaurant just around the corner from OSC's Potrero Avenue offices. "That's changed. Now we also have skateboarders who never learned what MIDI was but they know the computer well enough to record their garage band."

Rosen smiles. "Which is such a funny idea. They're actually in a garage physically, but instead of stacks of Fender amps, they've got the Mac and a large hard drive."

I first met Rosen and his partners in the spring of 1991, a few months after Wilsey pointed him out to me. At the time, OSC was located in a low-rent Mission District warehouse and garage. The garage, in the back, was where Myrberg hacked code all day. The warehouse,



Josh Rosen, Mats
Myrberg and John
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which doubled as living space for Rosen and his girlfriend, contained music and computer equipment: synthesizers, drum machines, samplers, a mixing board, and, of course, a Mac equipped with a 4-track Deck setup.

In addition to the original version of Deck, OSC had just released the company's first CD-ROM sound sample compilation, *A Poke in the Ear with a Sharp Stick: Volume 1*, which included such unusual samples as "Martian Ethnic Instruments," "Grungeomat," "Post-Nuclear Holocaust Ambiance," and "The Sounds of Carnage."

Standing in the doorway to the garage, Myrberg in 1991 sounded like a late '70s punk rocker as he talked about how the new technology that OSC and others were creating was taking the means of music production out of the hands of corporate-funded record companies and allowing the musicians themselves to control their destinies. "Musicians should seize the opportunity that this kind of inexpensive recording equipment allows to make things," he told me. "The control that these bigger entities have been able to exert on musicians is disintegrating. Now, if you could just get around distribution, which the major labels still control, you could completely democratize the production and distribution of music."

Three years later, you need to spend just a little time hanging out at the Internet Underground Music Archive (IUMA) (see *Wired* 2.11, page 146) <http://www.iuma.com>, to get a feel for what Myrberg was imagining. IUMA is a World Wide Web site with digitized songs by more than 200 mostly unsigned bands. It takes just a couple of minutes to download a 15- or 30-second excerpt of the Whistle Pigs or the Ugly Mugs and then decide if you want to take the time to download the entire song.

Many of the songs are superb. Others are mediocre at best. But there is something truly liberating about the idea of an artist who lives somewhere in Virginia, say, crafting a recording of his or her song in his or her own house using a Macintosh-based digital recording studio, then having the finished song put on the Net where it can be downloaded and checked out by a potential audience of millions. In the not so distant future it will be possible to download entire albums quickly over the Net.

"Developing technology that helps lots of people create music is a good thing," says Rosen. "People say, 'If more people record music, there's just going to be a lot more crap. But that's missing the point. People stand to gain a lot through demystification of

personal artistic expression. Even if you can't make something everyone thinks is good, you gain a lot realizing it is within your grasp to envision something and make it real. Realizing you can write a song means more than answering the question, Can they it sell to a million people?"

"Are there pitfalls to the idea that anyone can crank out bad media endlessly?" Rosen continues. "Probably. I find it hard to envision what the dangers are. Other than that in a market-based economy, with too much supply and less demand, music might become devalued, but I suspect it won't. And besides, why *shouldn't* the creation of music be part of everyone's life?"

"TOOLS ≠ TALENT" is printed in huge letters on an OSC poster (printed on recycled paper). The poster succinctly sums up the group's mind-set, which is radically different from that of your typical software or musical instrument company.

Also included on the poster is The OSC Manifesto, which reads in part: "Does equipment establish the elite? How much 'having'

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MONEY ≠ SUCCESS
Integrity CANNOT BE BOUGHT
CONSUME THE MINIMUM PRODUCE THE MAXIMUM
talk is a poor substitute for action
CREATE YOURSELF BEFORE SOMEONE ELSE DOES
Don't do what people tell you to do
Trust Your Heart
CONFRONT AND DOCUMENT
BELIEVE NOTHING

do you have to have?"

Sitting in his messy office, Rosen explains, "Years ago, I had \$150,000 of audio equipment, but I couldn't write a song if my life depended on it. I felt burdened. I had it all and it wasn't helping me. I got rid of most of it and found - for me, at least - that it helped me start to create again." Two years ago, OSC moved its offices into a former Pentecostal church ("They were speaking in tongues here, serious," says Rosen), and increased its staff to nine people. Rosen and his partners still get a kick out of puncturing the myth that, somehow, more equipment is all that is keeping Joe Musician from stardom.

Nearly five years after starting OSC, Rosen,

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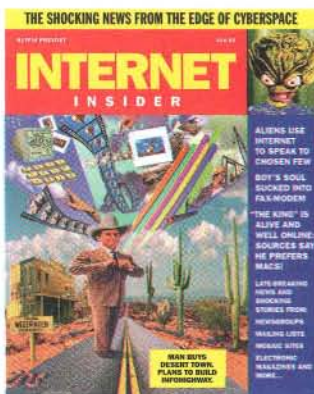
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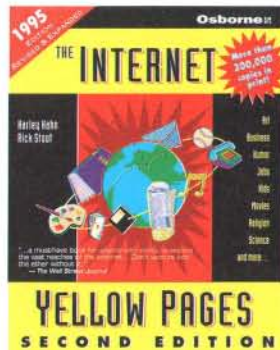
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34, still looks like he spends his nights playing industrial rock. "I've noticed some people read the manifesto and go, 'Are these guys selling the idea that they're not trying to sell anything?' To tell you the truth, when I wrote the manifesto stuff, I wanted to create a set of things that I could go to and check when I lost my way—to remind myself what was important. I still go back and look at that during a bad week. It's our positive statement.

"We sell stuff," he continues. "And that's how we survive. At no point did we mean to say there was something inherently bad about owning a business. All we wanted to do

**"On a simple level," says
Rosen, "We're a bunch of
people driven by interest in
the products we're creating.
Business is secondary."**

was find a way to remain proud of what we were doing based on something other than raw income.

"The key question for us is, how can you be a company, be a commercial entity whose bread and butter comes from selling something, and not get sucked into the fast-growth, high-consumption syndrome that characterizes American business?" This is the dilemma OSC constantly struggles with.

"There's nothing inherently bad about something that grows fast," Rosen adds. "But I think the decision-making cycle of a company compelled to grow quickly—especially when you're funded by venture capitalists who expect a fast return on their investment and aren't really in business for ideological reasons—tends to revolve too much around quarterly growth. Fast growth can be good, but it can lead to cycles of rapid expansion, followed by rapid downsizing. No one wants to be in a position where you have to let people go, or drop development of products you're excited about. It's scary if you get so volatile that at any moment the bottom can fall out. I wanted the ability to make decisions that I felt were based on a longer term, more forward-looking approach.

"On a simple level, we're a bunch of people driven by our interest in the products that we're making. Our knowledge and interest in business for the sake of business was always

secondary during the early days of OSC, and it still is."

Rosen continues to work surrounded by music and computer gear. On his left side is his recently purchased PowerPC; a Korg Wavestation is in front of him; a mixing board is to his rear; and videocassette players, amplifiers, and other sound—and video-processing equipment are to his right. There's even some non-high-tech stuff, like an old-fashioned electric guitar.

Looking at the Wavestation, which is covered with computer and audio magazines, he laughs, "Is it a desk or a keyboard? Depends on what time of day it is."

Asked why he and his partners named their company Our Stinking Corporation, Rosen smiles again. "We weren't totally comfortable with the idea of forming a company." Why? "Typically, the start-up model is this," he continues. "You start in the garage with two people who are tremendously interested in what they're doing and five years later there are 700 cubicles, everything's become bureaucratized, and nobody is really personally interested in what's going on."

Rosen shakes his head. "Primarily, we were trying to set up something minimally consumptive, and set up to grow and eat as little as possible. I guess we were trying to create an environment where everybody could stay creative and enjoy what they did and survive—instead of looking at quarterly figures and judging success by growth."

Yet, despite themselves, OSC has grown—at a rate of about 100 percent a year. Last year, OSC grossed about a million dollars, and Rosen predicts the company will gross \$1.5 million for 1994. "Making money was never an explicit goal," says Rosen. "But it's implicit. You can't escape that in the world we live in. Ultimately you measure success as combination of personal satisfaction and cash in the bank."

He grins. "But I don't suspect anybody got into what we're doing for the cash. In the computer industry there's a lot more money in almost every other realm. Look at someone like Mats. He could have made much more money doing telecommunications or larger-scale signal processing work. That's probably still the case."

On another day, Mats Myrberg will tell me this: "I just get off on the technology of music. We were just trying to make a living creating tools and having a fun time doing it. When we first made Deck, we thought, 'Geez, this would be really great,' cause we could all use

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it! We make things that we want to use."

OSC, so far, has managed to avoid the corporate pressures that so often close in on entrepreneurs once the company they've founded begins to grow. In his office, Rosen sits quietly for a moment. Finally he says, "We ask ourselves, How many other companies have started out with a brilliant product, something incredible, and have managed to stay driven by actually using the thing they're making?"

The answer is obvious. "Not a hell of a lot."

It was in 1987 that Rosen decided to move his techno band, R-Complex ("They use that term to describe the reptilian part of your brain," says Rosen; "it's supposedly what makes you want to dance"), from Portland to the San Francisco Bay area. To pay the rent he got a job at Blank Software, designing Macintosh programs for the Mirage sampler. That's where he met Myrberg, a programmer who had defected from Ensoniq, a company in the synthesizer business.

Myrberg says he was bored at Ensoniq. So he took a job at Blank and what he describes as a more than 50-percent pay cut. "Once they figure out you're good at something, they want you to do that thing over and over and over again," says Myrberg, who is now 34. "I didn't want to write another sequencer and decided it was time to leave."

By 1988, Dalton - who had played in a band and shared a house with Rosen in Oregon - had followed his friend to the Bay area. Dalton, a musician and hacker, put together a Rube Goldberg recording and sequencing setup at his apartment that made use of two computers and an analog multitrack tape recorder. It was not the most elegant of setups. It was Rosen's frustration with the limitations of Digidesign's "Sound Tools," a program for editing two tracks of audio on a Mac, that led the young men to create what would become OSC's first product. "I wanted to be able to record on the left channel while listening to the right," says Rosen. "I asked Mats, 'Is this possible?' Mats came back to me and said, 'Not only can you play the right while recording on the left, but I can build you a 4-track!'"

"One of the things I had always done was write real-time software, which means what it says," says Myrberg. "Things have to happen in real time. And because I had written a lot of code in assembly language - what you had to do to make things happen in real time at that point - I could make a great program for digital recording on the Mac. So then we

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"A Magna Carta for the Knowledge Age" emerged from an August 23-24 conference in Atlanta, Georgia. Participants included Jerry Berman, Esther Dyson, John Gage, George Gilder, Jay Keyworth, Lewis Perelman, Michael Rothschild and Alvin Toffler. Major support for the conference was provided by **BELLSOUTH** and the Competitive Long Distance Coalition. Additional support was provided by Agorics Enterprises, Inc., AT&T, Cox Enterprises, J.L. Dearlove & Affiliates, Forbes, Scientific Atlanta, Video Tape Associates and Wired. Creative Consulting and Ad Production by J.L. Dearlove & Affiliates, Chicago, IL.



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"Music for the Masses"

came up with this prototype, this 4-track recorder to mimic a low-fidelity 4-track cassette recorder. That was the fall of 1989. It took us, like, eight months to write the program and ship it."

They formed "Our Stinking Corporation" in 1990; Deck shipped that summer. "We'd all heard the story of The Beatles recording *Sgt. Pepper's* on a 4-track recorder," says Myrberg. But the drawback with analog recorders has always been that, as you add more tracks to a piece, you lose sound quality. With Deck, OSC created a product that could record and store music digitally. Digitally recorded music doesn't degrade in quality; you can add mul-

**"It's not going to be that
long before you'll be able to
record 16 tracks on your
Mac, add digital effects, mix
and master, and even create
a master CD right at home."**

multiple tracks without losing or muddying the original tracks.

This was a breakthrough. For the first time ever, Deck let musicians record multiple tracks on a home computer. "The digital musical tools that existed for PCs before Deck were not compositional tools. They were editing and mastering tools," explains Rosen. "You still had to go into the studio to record. When Deck hit, it changed the game. Suddenly anyone could generate actual source material. Laying down guitars and singing later or adding drums - whatever you want."

"Today the tools available for the PC are so sophisticated and advanced that there's no professional recording studio that doesn't use some of them," says Rosen. "For me, the greatest moment was the first time I could record a sound on one track and play that back and record the second track. First time I did that and it came out sounding like a CD, I was ecstatic."

Rosen says sales to date of the various versions of Deck total about 5,000 units. OSC currently handles software design, sound sample creation and editing, packaging, assembly, and shipping from its offices. The company also runs a postproduction house, MetaLanguage, which uses the software OSC develops to work on films and commercials.

The latest product is a piece of software called "Trans•port." In a nutshell, Trans•port

converts digital tracks recorded using a high-end digital-recording system in a professional studio to a "Deck session," which can then be taken home and worked on using a Mac and Deck II. The work done at home can then be converted, using Trans•port, back to the format used at the professional studio. "It allows you to take advantage of two things a well-equipped studio offers that your home typically doesn't offer," says Rosen. "One, a great sounding place to record and, two, a well-calibrated place to mix."

The OSC partners typically don't concern themselves with writing software for hardware that doesn't yet exist. Instead, they write



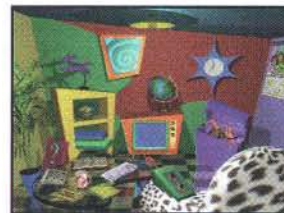
software that uses current hardware in a new way. "All you have to do is watch the landscape of computing go by," says Myrberg. "All kinds of opportunities are there."

One afternoon, after Joe Bini, who runs the studio, demos a few rather impressive commercials that were worked on at MetaLanguage, OSC's other co-owner, John Dalton, who is 36, leads me to a small kitchen where, seated at a round table, he starts talking about the future.

"The music studio of the future is just a computer," says Dalton, a soft-spoken man who wears his long brown hair in a ponytail. "You'll do it all in software. Now you can spend \$4,000 on a synthesizer, and a year later, you need to buy another synthesizer to get new sounds. In a soft environment you just add another software module." Dalton believes that, ultimately, "open" programs like Deck, which can control, or be controlled by, a number of different MIDI sequencer programs, will take over. "People say that by the turn of the century we'll have supercomputer performance on the desktop for the price of a Mac today. We think a modular software environment is the answer. Trying to make a latch-key proprietary system doesn't work anymore. Look at what happened to Synclavier [an expensive digital recording device that was rendered passé by low-cost Mac-based systems].



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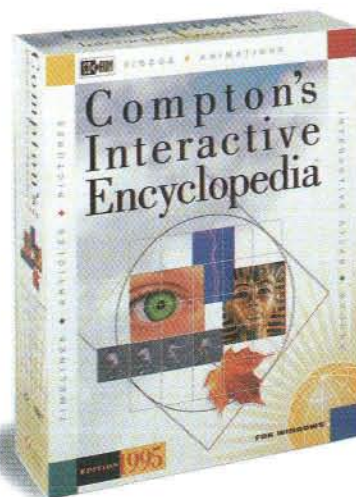
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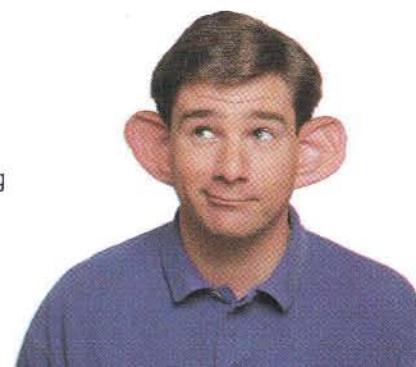
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"Things are always changing. In a virtual environment, synthesis modules will work together. We are committed to making our stuff work with other people's stuff. We foresee a world where they all hook together."

Such a system will allow a producer to utilize software from numerous companies to add reverb, EQ, distortion, and other DSP processing to the various tracks. Software will also eventually allow for 16 or even more tracks. Already, the open modular concept is partially in place. For example, in putting a Mac-based studio together, one can choose from hard drives made by numerous companies. There are more than a half-dozen MIDI sequencer programs and most are compatible with Deck. You can even choose from a variety of Macs to run recording software on.

"It's not going to be that long before you'll be able to record 16 tracks with your Mac, add digital effects, mix and master, and even create a master CD right at home," says Rosen. "We're very close."

"We have a lot of crazy ideas for things," says Dalton. "New ways to do sound synthesis, a different approach to a sample editing program." Dalton thinks that in many instances, when it comes to creating pop and rock music, "the studio thing is a myth. Look at U2's *Achtung Baby*. If people work within the limitations of what they have, they can do amazing things."

Dalton, Rosen, and Myrberg seem to have an almost religious conviction about following one's own vision. "Our idea was to see if you could have a company that wasn't focused on the business of business, that was more focused on the ideas and the products," says Rosen. "Are we a success? I suppose it depends wholly on what your goals are. What I always come back to asking myself is: Are we happy? Are we proud of what we make? Will we make payroll for the next few months? The answer to *all* those questions is a resounding yes. A lot of people say, well, those are not very ambitious goals. But they've served us well."

He pauses and looks down at the keyboard for a moment before continuing. "We look at OSC as an experiment. We don't know yet if, in the long run, it'll work or not, but so far it looks pretty good." ■ ■ ■

Michael Goldberg (insider@netcom.com) contributes regularly to Wired; he's been using a Mac-based multitrack digital recording system for the past three years.

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Natural Born Killjoy

With *Natural Born Killers*, Oliver Stone has defected.

He has joined the editorial boards, J-school deans, religious fanatics, righteous boomers, Janet Renos, and other blockheads who hold popular culture responsible for the decline of America.

By Jon Katz

Near the climax of Oliver Stone's *Natural Born Killers*, a reporter for the reprehensible tabloid-TV show *American Maniacs* interviews serial killer Mickey, live from a special cell in his teeming, seething prison. How did it feel to slaughter something like 50 people? the journalist asks. "Murder is pure," Mickey replies, as the

inmates watching this interview, aired just after the Super Bowl, begin rioting and butchering their guards as well as one another. "Was an instant of my purity worth a lifetime of your lies?" he asks. The journalist has no answer.

Thanks to Stone, media bashing is no longer just a fashionable stance but now, literally, an art form. *Natural Born Killers*, in fact, redefines

media bashing. The box-office hit (out on video by January) is one of the most savage attacks ever launched in pop culture against the amalgam of information structures we call mass media. *Network*, the previous contender, looks like *Aladdin* in comparison. Stone not only holds the press in general, and television in particular, responsible for American violence, but places journalists several moral rungs below its most vicious practitioners.

As *Natural Born Killers* so dramatically illustrates – and as Oliver Stone understands so well – the American media are entering the third decade of an increasingly bitter cultural civil war. A generation ago, Americans shared common media, more or less. Almost everyone read daily papers, watched the networks, or poured over the newsweeklies.

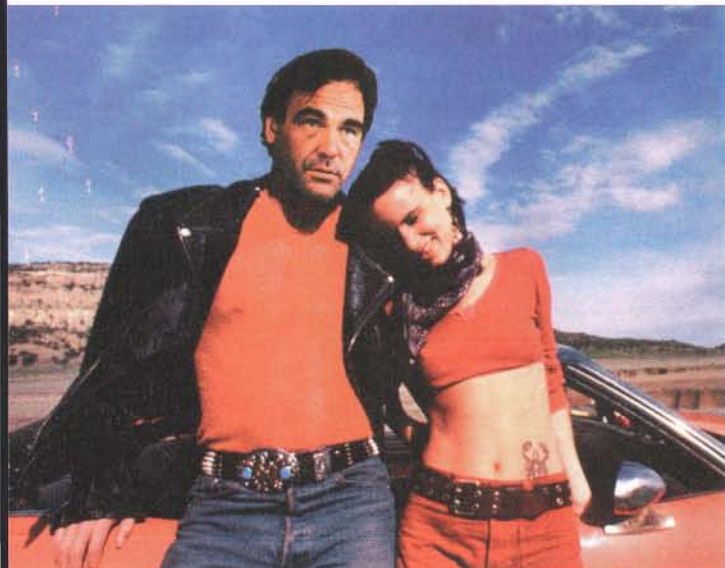
That universality has been shattered, probably for good. Information now splits along demographic, political, and cultural fault lines. We all look into our separate mirrors now and mostly see only ourselves looking back.

What was universal in the post-World War II years has become the media of the middle class, the political and policy structures, the aging and increasingly self-righteous baby boomers.

And the rest of the country? Increasingly, groups divided by such things as gender and age are drawn to media that they believe reflect their own values. Kids play computer games, watch cable, and read niche magazines. African Americans have turned to their own magazines and listen to their own talk shows. For blue-collar and working-class Americans, the media that matter are talk shows and tabloid telecasts. To the outraged protests of the more traditional media, the biggest stories generated by these outlets tend to be driven by those characters the public recognizes on a first-name basis: Amy and Joey, Tonya and Nancy, Lorena and John Wayne, Erik and Lyle, and O.J.

This has not been a peaceful evolution. Stories themselves have become bitterly controversial, one medium pitting itself against another, following its own agenda and deriding the others. Stories about Tonya's attack on Nancy or the fall of O.J. Simpson instantly transcend themselves; they're no longer just yarns but reflections of our moral and civic attention span. It isn't enough to cover or follow these stories; the media and the public spend almost as much energy fighting about whether we should be covering them, their cultural identities partially defined by the sides they choose.

Oliver Stone has long been one of the fiercest warriors in this cultural conflict. He has galled and provoked mainstream journalism more skillfully and provocatively than any other major filmmaker. He's also one of a growing cadre of musicians, filmmakers, writers, and TV producers that's inventing a kind of quasi-journalism that mixes fact and fiction, reenacts history, assaults conventions, and intrudes repeatedly, sometimes brilliantly, on what the press sees as its own sacrosanct turf – Vietnam, Wall Street, and the assassination of John F. Kennedy. In *Natural Born Killers*, Stone has defected. He's switched sides, darting across our cultural Checkpoint Charlie to join the coalition of editorial boards, journalism school deans, religious fanatics, smug boomers, Charlton Hestonites and the other blockheads who have long held popular culture – from television, rock, rap, and computer bulletin boards to *Beavis and Butt-head* and, especial-



Natural Born Killers is one of the most savage attacks ever launched in pop culture against mass media.

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For better or worse,

programs like *Hard Copy*, *A Current Affair*, and *Inside Edition* have transformed journalism,

both print and electronic.

ly, tabloid telecasts – responsible for the decline of America.

Too bad: Stone was far more effective as a renegade.

Whether or not he's a great filmmaker, and whether or not *Natural Born Killers* is a great film (indeed it has stretches of true brilliance), Stone's premise is profoundly dumb, grossly unfair even to media that generally deserve all the bashing they get and might even benefit from a lot more.

He advances an astonishingly ignorant and demonstrably false argument: that tabloid television, newsmagazines, local newscasts, supermarket tabloids, and even the straight press have created or sustained violence in the US. Despite that there are millions of Americans who are happy to believe it, Stone's premise remains ignorant.

The tabs can no longer be seen simply as trashy exploiters. They have struck at the heart of mainstream journalism's narrow political and social agenda. They have no ideology, but they remind us every day that most of us live in a difficult, violent, divided country whose safety net frays more every day. Having no historic traditions, the tabs lack any pretense of noble purpose. They don't have to cover "important stories," only good ones.

Sometimes for better and sometimes for worse, programs like *Hard Copy*, *A Current Affair*, and *Inside Edition* have helped transform journalism, both print and electronic. They have siphoned millions of viewers away from the network's evening newscasts. They have spawned a whole generation of derivative, though tamer, TV newsmagazines – among them *48 Hours*, *PrimeTime Live*, and *Now*. They have taken individuals' recountings of major stories out of the public and journalistic domain and made them valuable properties, introducing to American journalism the radical, troubling notion that people with great stories to tell should be

compensated for telling them.

Attacks on such broadcasts have been relentless. The very word tabloid has become a synonym for crude, exploitive, or dangerous. In a *New York Times* op-ed piece that ran in March, former CBS anchorman Walter Cronkite urged that broadcasters be required by law to "state the amount any interviewee is paid for performing."

A critic for the *Los Angeles Times* agrees. "The differences between *The New York Times* and *Hard Copy*," writes Tom Rosenstiel, "although they're there – are diminished." Even publicists are unnerved. "Tabloid journalists, no matter how pleasant, are not your friends," writes Fran Mat-era, PhD, a journalism professor whose article appeared recently in the *Public Relations Journal*. "They are often there to trick or trap your client. They are looking for that one killer shot where they catch you or your client stammering and fumbling. That's what sells and earns the reporter accolades." Sweet irony of ironies, Stone has made – minus the gore and cinematic wizardry, of course – the very movie about the media Cronkite would have made if he could. If we could only go back 30 years or so, media time, everything would be OK. The country would be safe again.

Like his colleague Spike Lee, Stone has brilliantly marketed his own rebelliousness, his reputation as a fearless iconoclast. But there is nothing daring about attacking the media these days. Journalism – like law enforcement, the Pentagon, Wall Street, and politics – is a cultural free-fire zone. As irresponsible and repulsive as he works at being, Rush Limbaugh is a lot bolder, the cows he goes after more sacred.

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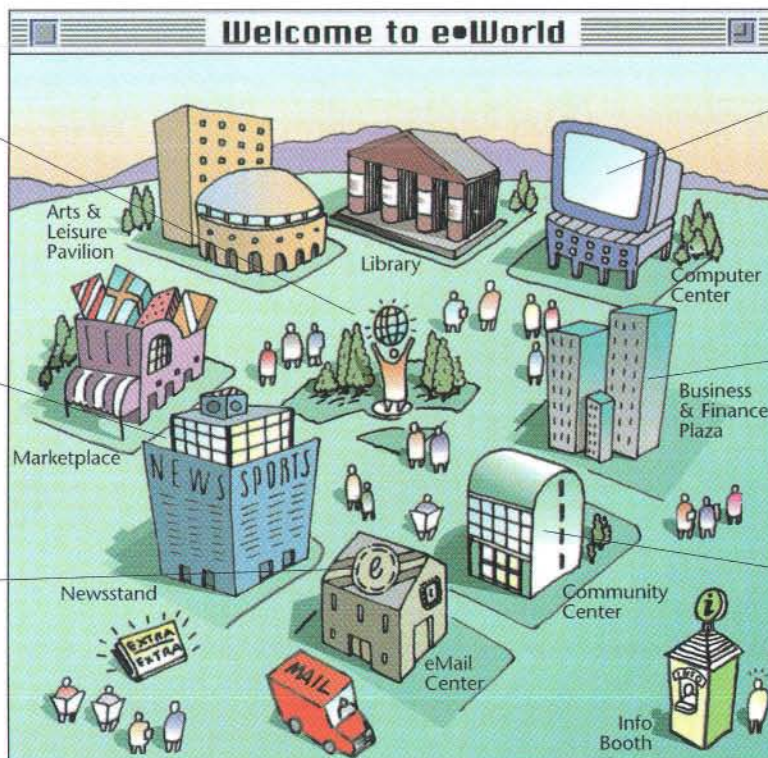
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Killers had the largest opening ever for an Oliver Stone film – it took in US\$10.6 million at the box office its first weekend and was the No. 1 movie in America, doubling the draw of *JFK*. By the Labor Day weekend, it had earned \$27 million.

But like many of his fellow boomers, Stone is more interested in playing the renegade than being one. Otherwise, he would have made a movie that looked at the real causes of violence: at race and the underclass, at the gun culture, at whether drug control is remotely possible, at whether conventional law enforcement works at all, at the phenomenal percentage of violence perpetrated by males on one another and on women. In choosing to pin violence on cheap scapegoats, Stone isn't taking on the media, he's aping its timidity.

Journalism is happy to focus on police brutality and statistically rare crimes like carjacking or child-snatching but, like Stone, the media are less eager to tackle the more complex and sensitive issues that really underlie violence.

"Let's look at the statistics," Stone told

Time magazine in August. "Violent crime has remained flat over the past 20 years. But the perception of crime has changed; now it's the No. 1 enemy. Every night on the news it's back-to-back murder and body bags." Who would have thought that Stone – himself the target of so much righteous ire in the wake of *JFK* – would embrace the now-famous Beavis and Butt-head argument: guns mixed with drugs and poorly educated, unsupervised kids don't kill people; tabloid TV shows do. Or videogames. Or rock and roll. Or rap.

As long as we're looking at the numbers, let's consider these federal statistics from the Gallup Organization: the murder rate for whites – yes, even TV-watching ones – decreased sharply between 1968 and 1994. However, the murder rate for African Americans during that same period climbed by 65 percent. (Media coverage of the deaths of African Americans did not increase by 65 percent during this period.) Or this one: the Justice Department reports that individuals armed with handguns committed a record number of violent crimes in 1992 – 950,700 of them altogether, which reflects a 50 per-

cent increase over the average for the previous five years. No population group was more vulnerable to that trend than young African American males, who were four times as likely as white males to be the victims of handgun crime during the time that they were between the ages of 16 and 19.

Virtually no serious governmental or academic student of violence-related social problems and crime in America has found music or broadcasting to be primary causes of the staggering increases in underclass minority crime. Instead, virtually all cite racism, declines in public education, absence of jobs and vocational training, deteriorating family structures and urban economies, absent fathers, epidemic drug use, the availability of cheap and lethal weaponry, and the flight of the urban middle class from cities.

On August 16, the presumably fearless Stone answered prescreened and almost universally fawning questions in an interview conducted in cyberspace, in the auditorium of America Online. (Yup, it was in the Wired Auditorium.) Typically, Stone the celebrity fielded online questions that were about as hard-hitting as those on morning television interviews.

"My point was to show the American landscape in the 1990s as reflected in the media," Stone told his admiring America Online audience. He then added that he hoped *Natural Born Killers* would "make my audience think about the consequences of this social and cultural violence."

His point missed the point. The truth is that Americans think plenty about social and cultural violence, which is precisely why the tabloids cover it so much more than the so-called serious press.

Stone closes *Natural Born Killers* with video clips of the Menendez brothers, Rodney King, Lorena Bobbitt, and O.J. Simpson. Presumably, the point is to remind us that media evil is still with us, even as we toss our popcorn cartons into the trash. But Stone's hypocritical movie brings to mind the moral confrontation in *Natural Born Killers* between killer and reporter. It seems he got it backwards: an instant of tabloid purity is worth a thousand facile self-justifications from Oliver Stone. ■ ■ ■

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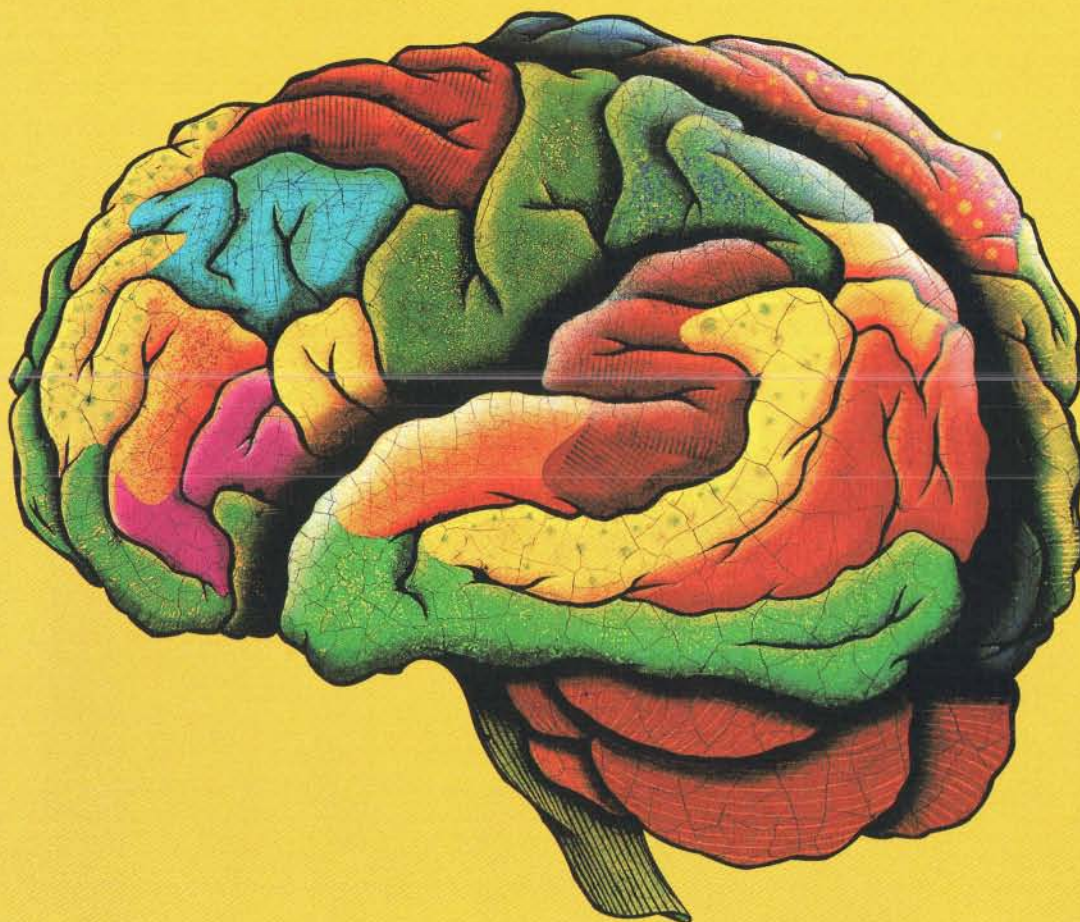
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A Couple of **Hyped** Guys Sitting Around Talking

Two **icons** of a mediated generation
discuss celebrity, technology, and solitude
as the ultimate radical act.

Interview by John Battelle

Since the almost concurrent 1991 releases of their generationally defining works, *Slacker* and *Generation X*, director Richard Linklater and author Douglas Coupland have followed roughly similar career cycles. Rich's *Dazed and Confused* and Doug's *Shampoo Planet* and *Life after*

God engendered little of the marketing feeding frenzy of their predecessors, but neither Rich nor Doug could entirely escape being influenced by it. Their upcoming works – Doug's novel, based on "Microserfs" (which first appeared in these pages last January), and Rich's film, *Before Sunrise*, about two strangers who meet while traveling in Europe – will both debut next year.

Doug and Rich seem so numb to the hype around their generational voices that discussing even the deconstruction of that

myth is taxing for them. If others glom onto their thoughts, they say, so be it. Fine. Hollywood and New York, the film and publishing worlds, wooed them both after their first works came out, and while each had the chance to sport Armani suits and live in the land of fabulous parties, neither bit. Doug stayed in Vancouver; Rich stuck to Austin. Doug never sold his books to Hollywood, and Rich has yet to direct a *Terminator* spinoff.

Though they are good friends, Doug and Rich have not been interviewed together since they first met, three years ago, via satellite on CNN's *Sonya Live*. On a hot afternoon in Austin, *Wired* Managing Editor John Battelle got together with them to change that.

The scene: Rich's two-story headquarters, probably a dentist's office in a previous incarnation. Rich and Doug, both shoeless, are draped over two shag sofas, facing the television on which Rich often watches videos. Framed movie posters cover every conceivable wall space in Rich's office, many of them Polish one-

sheets reflecting a time and place where art wasn't a commodity. Behind the sofas is an open area containing a ping-pong table.

Rich: Do you either of you play ping-pong? People always assume things go to hell – but not ping-pong balls.

Remember as a kid? *Slam blam!* The ball was broken in three seconds. But these days it's impossible to break a ping-pong ball. I bought about nine thinking we were gonna go through 'em. We haven't cracked one. And we play some serious ping-pong.

Doug: I get so pissed off at people who say things are worse. There has never been a better year to live than 1994.

Rich: Exactly!

Doug: Everything is better. Everything. There's nothing worse. What's worse? Everything functions better.

Doug pivots on his couch and throws his legs over its back. Comments are traded: Airline service. Michael Jackson. Rich's 1968 midnight-black GTO. Heat. MTV.

Wired: What about television?

Doug: Better than ever. In Portland, Oregon, I got a copy of *TV Guide* from 1967, and I read out loud from it at readings, just to remind people how boring and bad and idiotic TV was back then. *F Troop*. But, you know, nowadays, on any given week, there are probably eight really good shows on.

Rich: I have to confess, I haven't watched television since I was a teenager. I watch about 10 hours every two years.

Doug: You watch TV the way I watch it. People tape things for you.

Rich: Yeah. I just can't time my day around it. If it's anything good, I hope it'll filter back via videotape, like when Eric Bogosian is on *Larry Sanders*. Or it'll be available at stores. Like *Tanner 88*, the show Robert Altman and Garry Trudeau did during the 1988 elections. It was the most brilliant television ever. I missed it at the time, of course, but it came out on video.

Doug: I confess, I watch TV in hotel rooms.

But you guys met on television, right?

Doug: We met on CNN, on *Sonya Live*.

Rich: We met via satellite. I was in New York, you were in L.A. I like that, two towns neither of us lives in.

Doug: It was '91, summer.

Rich: *Generation X* had been out a couple months. And it

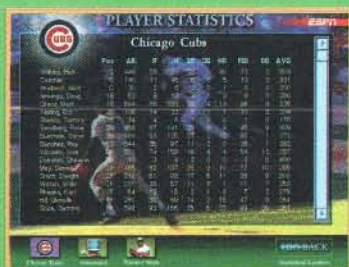
Rich (left) and Doug first met via satellite three years ago. They haven't been interviewed together since.





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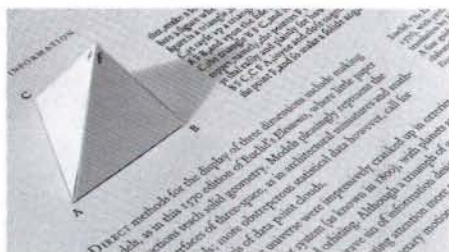
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ELECTROSPHERE

was just starting to take off.

Doug: And I was just so grateful that *someone* would even pay attention to it. It was no overnight sensation.

Rich: *Slacker* was opening the same week. The way this stuff works is, like, my distributor and your publisher, they got together.

They sent me your book. I don't know if they sent *Slacker* on video to you or something?

Doug: Yes. I was in Montreal at the time and we were watching it at a friend's place and going, "*Cooooool!*"

Rich: Somebody was saying, "There's a trend here or something." And it was like, OK, I'll read it. I was so relieved that I liked it so much. I'd never met Doug, I didn't know who he was, and I didn't know anything about it.

Doug: "Generation X" is now a cliché, but *then* the whole notion that there was some other group, some other way of perceiving the world that was different from Michael Douglas's baby boom, or Jane Fonda's baby boom – it was heretical. To a certain tiny bunkered group of boomers, it still is.

In '91 you guys were both what age?

Rich: 29.

Doug: And baby boomers had been basking in that warm, red, French-fried heating lamp of publicity for 35 years or something.

Doug sits up and announces he's going for coffee. He pads downstairs to the parking lot, where a few of Richard's friends have set up an improbable cappuccino cart: "It's doing pretty well, actually," Rich says. "It doesn't take much to make culture in Austin." Doug comes back in with coffees and a ginger ale.

Of all places, why did you guys meet on Sonya Live?

Doug: I'd never seen it before – and haven't seen it since.

Rich: Right after our segment they announced: "Well, thanks guys. Next, how to teach your cat to use your bathroom." And they showed a cat walking around a toilet seat. We were sandwiched in between cats peeing in toilets. But it was our 15 minutes.

Did something happen afterward? Any increase in fax and phone communication?

Doug: Not really. People assume that, like, one day Keanu Reeves and Winona Ryder show up at your front door in a limo with a bottle of Veuve Cliquot, and say, "C'mon into the limo with us!" But it just isn't like that.

What's your take on the commercialization of what you've done? There seems to be an exponential difference between those who have actually read or seen what you do and those who know about it.

Rich: And those are the ones who speak the most authoritatively about it. They grab a sound bite and add on their own generalizations and simplifications.

Doug: Slacker culture was even on *The Simpsons*. Commercialization of youth's been going on for 40 years now, so it's hardly some big new phenomenon.

Rich: Why don't we take a vow of silence for all time. A moratorium on Gen-X talk.

Doug: That's what I already do, more or less.

Rich: What's sad is that no one wanted to be part of a movement that would inevitably be parodied into stupidity. The ultimate counter-culture act to this whole media-nugget life is to not pay attention to any of it.

Doug: Reflection and solitude as a radical act – withdrawing from media density becomes the ultimate radical act.

Rich: You have to be a lot stronger to be that type of person nowadays. In previous countercultural movements – like the Dharma Bum '50s – the thrust was to find enlightenment, go Eastern in your thinking. That was an OK thing to strive for – people didn't make fun of you for it. Now even your best friends might have you committed. Culture doesn't

answer many of our needs. It doesn't speak to the deepest part of us, the part that doesn't change generationally.

Doug sits up in his couch, suddenly animated. His coffee cup is empty. He's kicking into high-fiber idea mode.

The year is 1961: insert blank fetal diskette. "Initialize?" – "Yes." Then zzzzzzzt: you're formatted, Buster.

Doug: The information culture you inhabit in the all-important 0-to-10-year-old age period molds the way you deal with information the rest of your life. That's where generations spring from, I think.

My parents grew up with radio and newspapers. That molds the way that they take in their information. I grew up in Vancouver, and Rich grew up in Texas, but we both grew up with bad '70s TV; there were no zappers, and you had to go up and change the chan-

nel. So you had, like, a half-hour attention span.

Whoever has the most energy to get off the couch and go change it gets to watch whatever they want.

Doug: Right. And computers were these huge Flintstone-like devices with punch cards. The year is 1961: insert a blank fetal diskette.

"Initialize?" – "Yes." Then, zzzzzzzt: you're formatted, Buster, and so are a whole bunch of people born around the same time as you.

The conversation turns to subjects eternal: Children. The Omen. Texas as world-serial-killings capital. Electronic wills. Mormon genealogical databases.

Aside from PCs, what was one of the major technological revolutions of the '80s?

Rich: Videos. That's amazing to me. I mean, god, in the early '80s if you wanted to watch *Touch of Evil*, and you lived in Bumfuck, South Dakota ... forget it, you would never see that movie.

Now Rich is leaning forward. He's talking about movies, his favorite topic.

Rich: You can have instant access to any clas-

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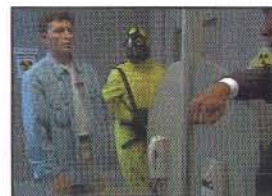
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sic. Everyone takes that for granted now, but I still think that's amazing. There was that excitement, somewhere in the '80s when you realized what was going on and what that implied, that ability to exchange art and information. I remember thinking something huge was happening.

Doug: We are so lucky to have mass culture. Rich and I grew up in totally different geographical places. And we have more in common than we have not in common. What's gonna hold everything together in the absence of that? Ideology? That doesn't exist any more. What else? Religion? Everyone's got their own religion.

Rich (*dryly*): Well, that's damn optimistic, Doug.

Doug: Well, *I'm* optimistic. Until recently, as a society, we had stopped equating progress with technology. Now we've begun equating them again. There's a big cinder block stuck on the technology accelerator pedal, and we're only gonna go faster and faster, never stopping. I think technology is good once again. I missed good technology during the '70s and '80s, during the two decades when technology was *baaaad*.

But that optimism, it didn't really infuse your first defining works, right?

Doug: I actually think they have an optimistic note.

Rich: Yeah, they're both dark, but optimistic in the abstract. I feel great when I see a work that's just so dark that you have to laugh. If you can totally articulate your darkest impulses, no matter how much it might disturb someone else – to me that's optimistic. Art shouldn't be judged on its overt message alone.

Is there anything in the media that you've seen about yourselves or your work that was completely, totally wrong, but that you kind of liked?

Doug: It's *never* right. Also, interviews are factual and unemotional – I don't like that. It's why I don't do them too often. Look at this interview – factual to whatever level, but not emotional. It's a misrepresentation of my universe, and that's inevitable in the interview process.

Doug and Rich trade a few press nightmares. Rich tells of a photo shoot for Us magazine that left him literally wrapped in celluloid and feeling utterly foolish.

Rich: I never felt awkward with my position behind a camera. But I wasn't really ready to be a "personality." The whole Gen-X thing – how can you sum it up? What is it, 40 million

people, and *no one* wants others speaking for them. Everything's a cliché, even to come out and say this generation doesn't want spokespeople. But yet, we're sitting here doing that, stating the obvious. It's like a snake eating its tail.

Doug: I'm left-handed. If I wrote a book about being left-handed, would I be the "official spokesperson for left-handed people"? No. In the end, there's nothing you can do that's not gonna piss off *someone*, so you can't even think about that. I think the *biggest* peril of modern times is being decontextualized.

Someone has to be taken out of context before they can be minty-fresh and media-friendly.

But isn't success, in this culture, dependent on knowing how to deal with that reality?

Doug: You just do what you're gonna do and not try and pre-guess the outcome. The media is not manipulatable. That's one of the great myths of the 20th century.

This gets Rich riled.

Rich: Let's not kid ourselves, the media can be *completely* manipulated. You don't think our government uses the media?

Doug: Wait a minute, this is something like Chomskyst paranoia, which I just don't believe in.

Rich: But it goes deeper.

Doug: OK, I guess if you look at nuclear weapons, for example, the media hype around them came about because governments had to justify spending so much on defense. If citizens weren't absolutely petrified of the nuclear threat, then the government couldn't spend billions of dollars in the Nevada desert. After the Wall fell, they quickly had to find sort of an intermediate villain ... drugs! The government does manipulate the media to its own end. So I take back my earlier statement that much.

Rich: And when the big stuff comes down, the media can use it to sink a president or not. Like, "Do we really want to pursue this Iran-Contra thing or not?" I don't think it's five guys having a secret meeting as much as it is the reflection of the general political thinking of the media gatekeepers.

Doug: I think that's sort of '80s. People don't pay attention to media lynchings any more. I mean, *The New York Times* covers Whitewater ad nauseam, and no one seems to care.

Rich: Clinton's smoked pot, he's had marital problems, and – hey! – he wants a blow job every now and then. Who doesn't? It makes him the first real human American president. Which is a good thing. I think that was

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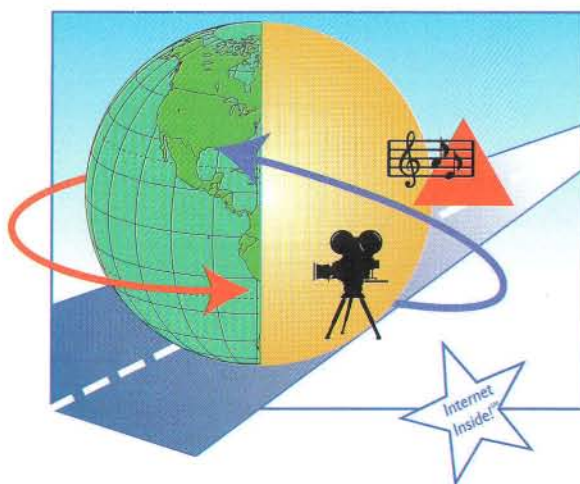
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Nixon's problem, all those years. I mean there's a guy who never got laid.

Satisfied, both Doug and Rich resume a reclined state on their respective couches.

Doug, who is completely slouched, says he might go out and get another coffee, maybe some food. Doug needs at least three coffee-and-carbohydrate-fueling stops to make it through an afternoon. Rich, the mellow cat who doesn't drink coffee, stares toward the wall, thinking and nodding his head slightly.

Are either of you afraid of being spit out by the media process?

Doug: I just write. This is something that gets forgotten. I write very personal stuff, a distillation of something in my own life. *(He pauses.)* Hey Rich – here's an experiment. Get out a piece of paper, and write down a description of someone who is *not* you. Describe the anti-Rich – the complete opposite of yourself. Now, put that description in a box and come back in six weeks. Chances are, you'll open it and find a description of yourself. The fact is, it's impossible to write something, anything, without that creation being you.

Rich: Exactly.

Doug: That comes through a film or painting

or books or whatever. And that gets lost. I mean, you *can't* speak for anyone else. Even if you wanted to, it's mathematically, technically, systematically impossible.

Almost. People look for other people, whose ideas they think are cool, toglom onto. It's part of human culture to say, "Those are the ideas I ascribe to! Thanks for thinking 'em up." Essentially, you two have the roles of being creators of ideas.

Doug: Some job description.

What places interest you?

Rich: I don't want to go anywhere.

Doug: The only places I'm interested in going are places where they make new ideas or culture, or intellectual properties are being generated. The West Coast mostly, Microsoft, Silicon Valley, Los Angeles....

Do you think we're post-Microsoft? No one company is going to create the future and give it to us on a plate. Don't you think the future's gonna be built bottom-up, like it always is?

Rich: Anything new and different has always come from the margins.

But even though you are both margin surfers, you don't eschew the trappings of

social celebrity, right? I mean, you don't just dismiss it.

Concerned with keeping the day-to-day workings of his life out of the media glare, Doug turns on his side, into the couch.

Doug: This is the stuff I'm not gonna say anything about.

Rich: Oh, c'mon, talk about that Hollywood party we went to that time.

Doug *(Turns around and sits up)*: OK, just one episode then. Rich and I went to this party. Who was that with? It was with Jane and Michelle and Julia. It was described to us in advance as "a small outdoor barbecue."

Rich: Free food. Hibachi.

Doug: Wear rags – *be casual*. We were wearing what we're wearing now, which is just like shit T-shirts and shit pants. I mean, we looked like the Manson family driving through Bel Air, and there were, like, 15 valet parkers with Madonna headsets. And we drove up to the front entryway, and four doors were opened at once, and before we had a chance to realize our mistake, the car was gone.

Rich: Yeah, we were stuck. It was one of those

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\$80,000 parties. (Puts on a TV announcer face.) "Your movie dollars at work."

Doug: And all these guests are dressed for the Academy Awards. We were the freaks.

Rich: Yeah, regardless of how casual L.A. thinks it is, it's really not. This is a Saturday night out, and they're *deked*.

Doug: A lot of first-namers there: Quentin, Uma, Winona. The evening was like, *One night we were driving down Sunset Boulevard and fell into the Alice-in-Wonderland hole — and we were dressed for housecleaning*. We later ended up at that all-night coffee shop eating Jell-O.

Rich: I don't think I had any Jell-O. But I had someone come up to me halfway through the party, this producer friend of mine, and he said, "I'm disappointed in you. What are you doing here?" Like I'm the outsider, you know, so I can't go where the wind of Hollywood might take me.

At this point Rich and Doug digress into a discussion of the party Rich is throwing that night for a bunch of friends. Beer, nonstop videos, and hours of ping-pong. Doug was going to fly back to Vancouver, but he decides

to stay and hang out with Rich. They haven't seen each other in a while. They compare the party that night with the Hollywood version and agree that if they had to choose, they'd rather be in Austin. But they'd rather not have to choose.

The conversation goes random. Scooby Doo. China. Vladivostok. Bruce Sterling. Sequels.

But you're suspicious of the Hollywood culture, right? The generation you purportedly speak for is so thoroughly mediated, it's suspicious of everything.

Rich: We all have a personal relationship with our *own* networks. I'm glad this generation is suspicious of everything. They're smart and media savvy. People say it's apathetic and cynical, but I disagree. We're not cynical, we're just not buying all the bullshit. If not being a mindless consumer is apathetic and cynical, well, fine.

Doug: If you look at the population bell curve, it's shifted enormously to the right. Human beings live 50 years longer than they used to 100 years ago, so percentage-wise, adolescence, which used to be confined to a tiny little period, is now stretched out. The period

in which one tries to locate one's identity as an individual in a cultural context is also extended. We expect wisdom of old people; in fact, all they do is drive Winnebagos.

Rich: But I think there's a lot more tolerance for various lifestyles at different ages. That's the good thing, right? Maybe that was the best thing about the media hype, like on *Sonya* three years ago. I had all these people living on couches tell me, in a very honest way, "Thanks a lot for making *Slacker*, 'cause you kinda validated a lifestyle, and it connected a bunch of us who were doing that." I even heard my dad at some social event talking to another guy about what his son was doing. The son had quit some job and was kinda drifting around, and his father was concerned. And my dad said, "Well, hey, maybe he's just having a good time and slowly heading off in some better direction." My dad would've never said that had he not seen *Slacker*.

Doug: Yeah. We're back at the beginning: There's never been a better year to live than 1994. Except for 1995. God, do I sound like a "Better Living Through Chemistry" industrial film, or what? ■ ■ ■

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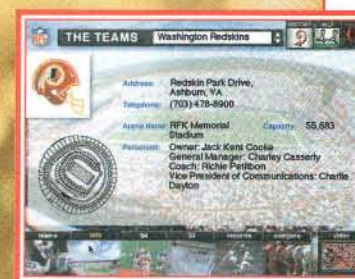
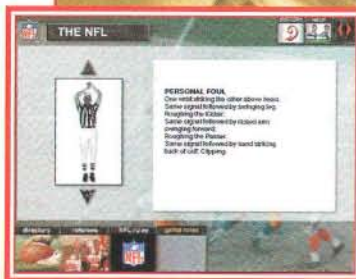
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Watching the Detectives

By Sandy Sandfort

"Quis custodiet ipsos custodes?"
Standing guard:
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Nearly two millennia after Juvenal asked his question, "But who is to guard the guards themselves?" no society has proven able to satisfactorily answer it. Throughout the world, innocent people still suffer at the hands of their supposed protectors.

Take, for example, the Haitian police force and its accomplice attachés, or the military forces of the ousted Hutu majority in Rwanda, whose protection of the Tutsi minority was tantamount to slaughter. The English may set high standards for character, thoroughly train their police, and forbid them to carry guns, yet bobbies are still accused of roughing up civilians and manufacturing evidence against suspects. (Witness the case of the Guildford Four, imprisoned wrongly by English courts in the 1970s and dramatized in the movie *In the Name of the Father*.) In the United States, civil rights laws, civilian review boards, and "cultural sensitivity training" still fall short in stemming police brutality. Around the world there is little to prevent cops from intimidating, harassing, robbing, framing, and victimizing those whom they are sworn to defend.

But what if someone were watching? What if society were to find a way to manifest the "fair witness" that was first conceived by Robert Heinlein in his seminal science fiction novel, *Stranger in a Strange Land*. A fair witness was a person trained to observe and remember events without prejudice or bias. What if it were possible to have a fair witness next to every policeman in the world? What if that fair witness were a machine?

We may live in the digital age, but police have not generally availed themselves of the most modern equipment available. Some civil libertarians might call this a good thing, arguing that arming cops with advanced technology, especially for surveillance, only gives them new ways to abuse our rights.

Another viewpoint, however, welcomes at least some high-tech police tools, especially those with two-way capacity. Properly deployed, a suite of high-tech devices can be our electronic fair witness to catch the bad cops red-handed and protect the good ones from false accusations.

Today's audio-video technologies make it feasible for juries to vicariously relive police actions. Imagine the courtroom scenes if a police helmet was equipped with a tiny video camera, perched like some mystical third eye in the center of the officer's forehead. Add a super-sensitive microphone next to each ear and, sprouting from the top of the helmet, various communications antennae. Imagine if everything the officer saw and heard was captured for later review.

Depending on a police department's budget, audio-

video data could be monitored and recorded at a central site, transmitted to a locked and hardened recorder in the officer's car, or kept in a secure video recorder carried by the officer. Recording would be continuous throughout an officer's shift (except under tightly defined exceptions). Tapes would be held in the custody of a neutral agency for possible later examination. A given percentage of the tapes would be selected at random to review general police conduct. If no disputes arose after a reasonable time, tapes would be erased and recycled.

No longer would juries have to rely on witness testimony, as they have historically, to decide what really happened during encounters between civilians and police. (Fearing crime more than they do the cops, juries often give officers an overly generous benefit of the doubt; police rarely lose such "swearing matches.")

Juries could become "virtual" witnesses in the police cases for which they have to return a verdict. Did the man resist arrest? Was the woman fondled by the policeman? Where was the dope? Who uttered a racial epithet? These questions, and others, would no longer be open to conjecture. The jury would *know*.

Current and emerging technologies can provide digital answers to these questions. The Global Positioning System is a US\$13 billion satellite navigation system created by the US Department of Defense. At its best, the system's hand-held units can determine their longitude, latitude, and altitude to within a few meters. Unfortunately, performance degrades in high-rise urban environments. Coupled with a cell-phone uplink, the Global Positioning System can automatically give periodic location updates. When desired, it can be "pinged" from the station house.

Meanwhile, just down the road from George Lucas's Skywalker Ranch in Marin County, a start-up company, co-founded by Bob Fleming, is developing an entirely new positioning technology. The original idea was to use the technology to precisely position ballet dancers' bodies and limbs in space, according to Fleming. With error margins of less than a centimeter, they will be able to create computer-generated playbacks of performances. These computerized recordings will allow the dancers to be viewed from any angle, or their moves edited for instructional or creative purposes.

Fleming's company also foresees the technology's use in law enforcement, especially given that one of its curious properties – its locational accuracy is relatively unaffected by intervening buildings or terrain – make it ideal for urban police work. These developers are watching out for your neighborhood watch commanders, who want to know three things about their officers: location, location, and location. But in the heat of a

chase or violent encounter, it's not always possible for the police to report – or even *know* – where they are. The inability to find an officer can be fatal.

But Fleming et al. aren't satisfied with merely *knowing* an officer's location. They envision the *continuous recording of a cop's bodily movements* – just like the ballet dancers – throughout a shift. They believe that single-chip, coin-sized versions of their units will be made cheaply enough for each officer to wear several on their uniforms and equipment – wrists, elbows, ankles, knees, heads, torsos, hips, guns, nightsticks. An officer's every move will be captured. Unlike video, this technology works in the dark and does not depend on the direction the cop's camera is facing. With such a recording, many

crucial questions can be answered. Did the officer violate department policy by clubbing a suspect with an overhand blow to the head? Did she shoot someone who was already wounded on the ground? Was he facing in the right direction to have seen the suspect he claims to have identified?

Many may worry that as technology becomes more and more prevalent in our lives, so does Big Brother. But technology may yet prove to be the best way to guard the guards themselves.

Sandy Sandfort (sandfort@crl.com) is a writer, cypherpunk, and outlawyer specializing in privacy issues. You can find him in various cyberspace and realspace locations.

Persistence of Locality

By Fred Hapgood

When everyone is connected, friends will come first.

The Net is breaking over the world and nothing seems more obvious than that it will further erode the relevance of geography in human relations. Everybody in cyberspace is a few keystrokes from everyone else; the canonical six degrees of separation seem more like two.

For most of the last decade, my Net correspondence, like most, has been with people I met over the Net and know only through their Net personae. But over the last year, as the proportion of people with Net access has grown, more of the activity in my mailbox has been dominated by people I knew or know primarily from the offline world: friends, family, classmates, neighbors. I think of these as my "physical," as opposed to "virtual," online correspondents.

As the Net has grown, my mailbox, like everyone's, has been handling more and more activity. Something has had to give, and what has given, in general, has been my virtual correspondence. E-mail that evokes a physical encounter, with all its sensory modalities and loss of control (you can't monkey with the colors of a physical person, scroll back through their conversations, or make their voice louder or softer – at least it would be impolite to try) reaches out and grabs me in a way that messages from a virtual correspondent do not. Further, messages by virtual posters tend to be defined by subjects; messages sent by a physical person tend to be organized around relationships, around personal issues. Often these seem more urgent, or at least more interesting.

At present, only a tiny fraction of my physical friends and relations are on the Net, but in the near future most of them will be here, together with mailing lists running out of all the neighborhood associations to which I belong: reading groups, discussion groups, vocational and political societies, alumni organizations, church

groups. I don't doubt that in time every family will have its own mailing list carrying contributions from its members. At that point – actually long before it – we will have to triage our mail still further. While I have had to do very little of this so far, I sense that the rules will be something like this: friends over strangers; family over friends; and within those categories, the geographically or chronologically close over the distant. Those most likely to survive the second cut are longtime friends who live nearby. Messages from someone I am likely to meet physically in the near future have the highest priority of all (among social relations).

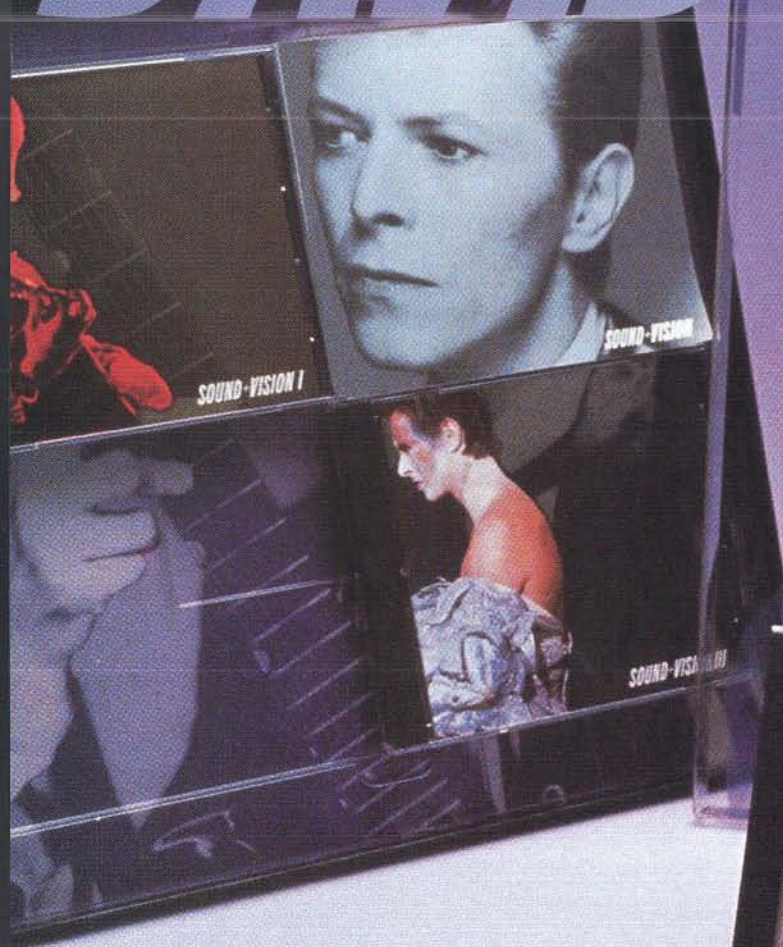
Recently, I read about a software developer who has six continuous teleconferencing sessions running all day, every day, in windows scattered around the margins of his terminal. The people in these sessions aren't even project colleagues – just friends he likes to banter with while he works. Eventually bandwidth will get cheap enough to allow almost all Net users to do something like this, and if they do, my experience suggests it will be longtime, local friends who will end up on their displays.

Until now, each successive generation in the 20th century has spread its time and energy among larger and larger numbers of people. Our great-grandparents might have known a few thousand people over their lives; most of us have spent at least a few hours with many tens of thousands. This is another way of describing the collapse of local cultures and the development of the world monoculture. It is possible, against all expectations, that the Net will reverse this trend, allowing us to spend more and more time with a smaller and smaller number of people. If so, local cultures might in time reemerge from the world monoculture.

Fred Hapgood (fhapgood@world.std.com) writes about science and technology and is based in Boston.

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By Chris Clark

Online advertisers are building an information landfill, but users just wanna have fun for free.

Discussions about online advertising have morphed from parlor talk to drunken brawls to foaming-at-the-mouth hysterics – and still no one has a clue as to how to do it right.

Too many people cite the McDonald's Interactive section of the NBC forum on America Online as the Rosetta stone of online advertising. Click on the Golden Arches and what do you get? Some cheesy (pun intended) McDonaldland coloring book GIFs, a corporate history, a survey, blatantly disguised as a contest, to which you feed your personal information for future McDonald's research, and a 30-second TV commercial that takes about an hour to download and run – if you have the right multimedia software.

For even more screen screams, check out Pontiac's CompuServe forum: The Philosophy of Pontiac Driving Excitement. (The *philosophy*?) Here you can not only learn about "The Worry-Free Ownership of PONTIAC CARES" (their emphasis and typo – unless they really meant "cares"), but you can even "Order a Free Pontiac Brochure!" Of course, unless you have a Firebird logo tattooed on your chest, this is probably not the sort of thing that's going to tear you away from your favorite alt.sex newsgroup.

Mass marketers actually think they're going to stuff the Internet full of all this wonderful *content*, which is supposed to represent the future of advertising, media, communications, and human interaction all rolled into one cute little branded icon we can access from our home PCs with the click of a mouse. But they're all missing the point. Online services aren't about information, they're about *entertainment*.

Advertising's traditional benefit is subsidizing entertainment: something we watch, listen to, and sometimes read. Information is different from entertainment; information is a collection of data we generally read in text format. It's what we used to call books.

Information is the library. Entertainment is the movie theater. Some people think the library is entertaining. These people should not be in charge of entertainment.

So what *should* advertisers be doing online? Marketers should get back to their TV roots – and they need to remember that people like entertainment more than information. The advertisers who will get rich by brilliantly exploiting online services won't do it by feeding us specs, brochures, and blatantly bad propaganda, but by being sponsors.

Let artists create content. Smart advertisers will make it big by sponsoring the digital equivalent of the *The Milton Berle Show* (aka *The Texaco Star Theater*). In the early days of television, advertisers paid a ton of money

to plaster their names, brands, logos, and slogans across anything on TV that wasn't moving. *General Electric Theater*, *Chevrolet Showroom*, *The Colgate Comedy Hour*, *Pepsi-Cola Playhouse* ... with the exception of *Walt Disney*, none of the sponsored programming of the 1950s was "about" the sponsors – but the brand responsible for the evening's entertainment was as clear as the freckles on Howdy Doody's face.

Today, General Electric, General Motors, Colgate-Palmolive and PepsiCo are probably contemplating dull, wonky Prodigy chat zones and World Wide Web home pages where consumers can download product ingredients, annual reports, and bitmaps from ad campaigns.

But advertising works by sneaking your commercial into a show your target market is watching. Let's say you're the director of marketing for a car company. Why not pay an online service a million dollars to start up a sports statistics database that anyone can access as a basic service? The odds are very good that the people who crave online sports statistics also watch a fair amount of sporting events on television. Splash logos all over the interface, the actual numbers, and the printouts. Run periodic contests to maintain interest in the service (giving away a car would probably do it). And then ask for a weekly tally of the people who accessed it. Wouldn't this be more fun for consumers than finding 500-plus megabytes of information about toothpaste?

If you're working for a company targeting teens, offer free *Doom XXVII* downloads instead of an advice forum on makeup. If you brew beer, start subsidizing the *Playboy* forum. And if you sell computers, give your customers 100 free hours on the online service of their choice in addition to no-cost access to your support forums (the good old free-taste school of marketing).

Online services can still extract their US\$8.95 a month for access and product delivery, which we'll gladly pay, in the same way we shell out \$50 a month for cable TV. But when we're merrily clicking icons to play in the various departments, forums, games, and databases of Heather Locklear GIFs, sponsors should pick up the tab, now billed separately as "premium" access.

By the late 1950s, advertisers finally understood the mechanics of the video medium, and television sponsorships mutated into the 30-second vignettes we tolerate today. Online advertising needs a 21st-century Uncle Miltie who can captivate the wired masses with amusing shtick while shamelessly hyping the sponsor who paid for it all.

Adam Curry, meet Jack Benny.

When not perfecting a bubblegrunge version of "Sing" in hopes of playing on the next Carpenters tribute album, Chris Clark does public relations for GCI Group in New York.

With Our CD-i Previewing System, What You See Doesn't Have To Be What You Get.

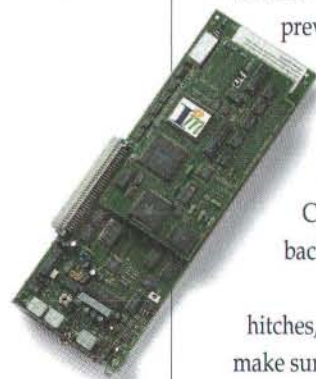


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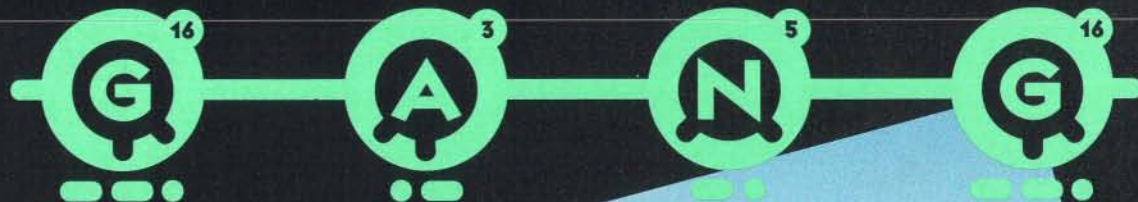
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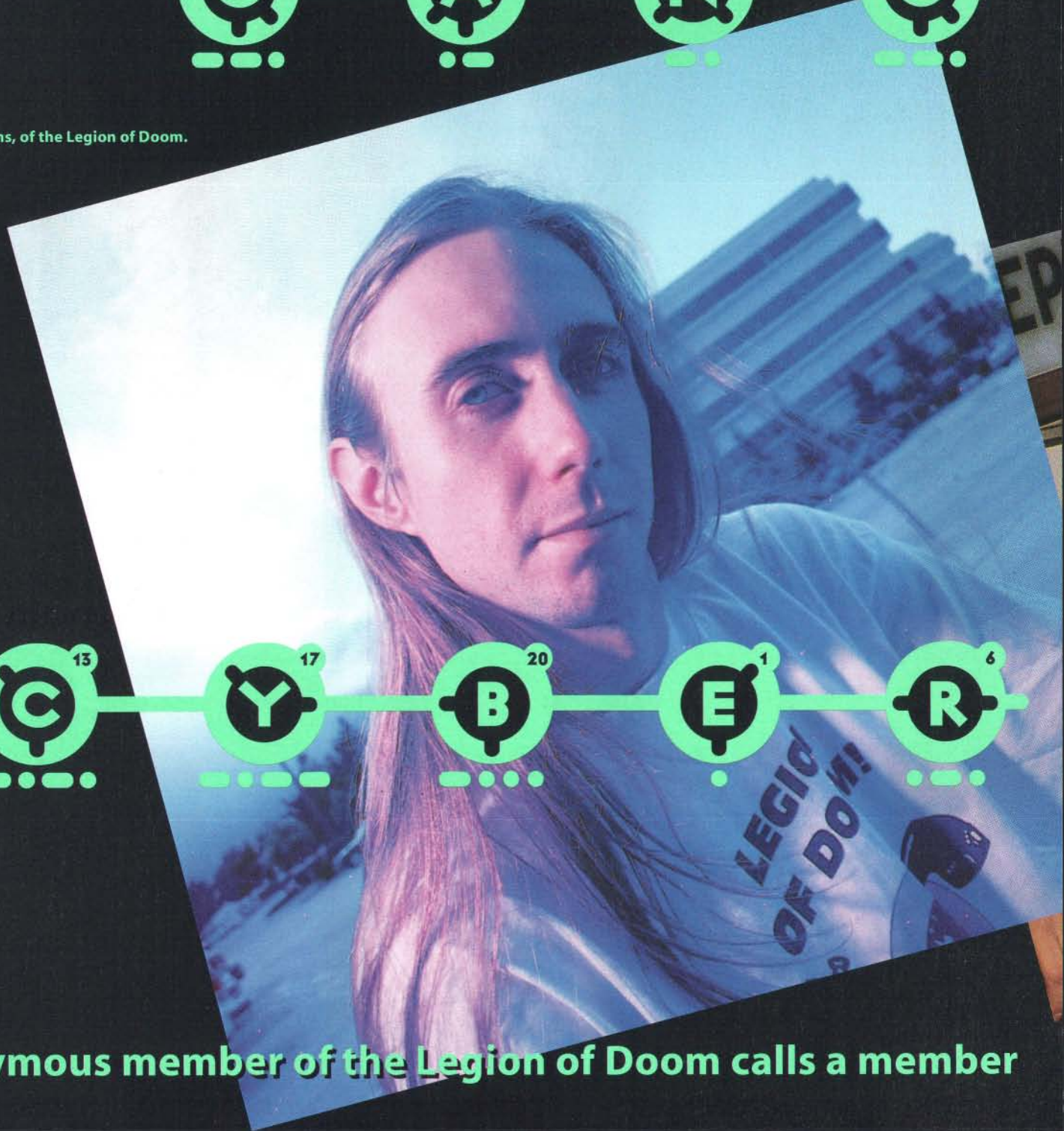


MediaPreview from I²m is designed to help you effortlessly preview your CD-i assets before burning a disk.

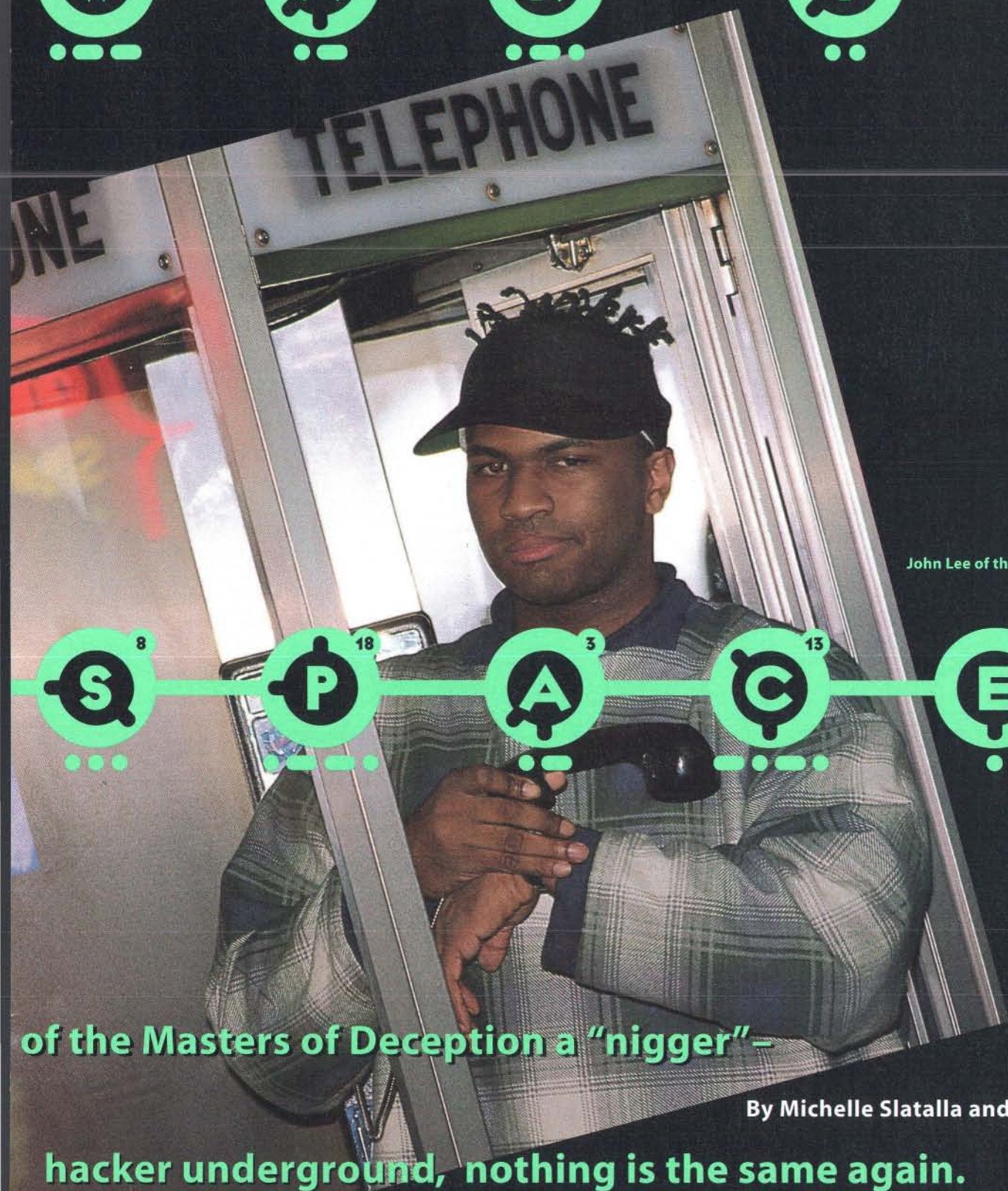
I²m
INTERNATIONAL
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MEDIA



Chris Goggans, of the Legion of Doom.



An anonymous member of the Legion of Doom calls a member
and in the loose-knit



John Lee of the Masters of Deception.



of the Masters of Deception a “nigger” –

By Michelle Slatalla and Joshua Quittner

hacker underground, nothing is the same again.



he whole story starts in 1989, months before the Martin Luther King Day crash of AT&T, months before Mark Abene and Paul Stira even know each other's names. The whole mess, which will grow into a world-class electronic gang war fought by hackers from New York City to Texas, starts back before Paul even knows what a switch is.

If you want to trace it to one night, to one single instant when you can say the whole story really begins, you will see this image: Paul in the dark, peering into a garbage dumpster.

The early summer evening is warm on his skin when Paul Stira, 19, leans over the edge of the dumpster as far as he can. This is one way to become a computer hacker. It's the way Paul has chosen. He tries to snare one of the five or six invitingly swollen bags that sit in the bottom of the dumpster. It's not enough to be 6 feet tall, because Paul still can't reach the bags, not until his stomach becomes the fulcrum for his body and his feet actually leave solid earth. He dangles, the blood rushes to his head, he gets dizzy. And yet there's nowhere he'd rather be than here, climbing around in this dark alley in a dumpster full of phone company trash, looking for computer printouts.

He came for the documents. But he also came for adventure. Right after scarfing down a quick supper earlier in the evening, Paul mumbled goodbye to his mom, who was still getting used to the fact that his dad had all of a sudden died. Then he hopped a bus to the end of the line. He got off in Jamaica, Queens, at Parsons Boulevard and Hillside Avenue, an intersection in a neighborhood hot with bodegas, bars, and beeper-rental joints. He stood for a while, afloat in the dwindling stream of commuters flowing from the subway. And then, a black Supra full of teenagers pulled up to the curb, and the dark-eyed guy driving checked him out, smiled. Paul got in.

This building was built back when there was only one telephone company, Ma Bell.

They sidle up to it. There are bars on all the two-story windows and through them, a vast, loftlike, fluorescent-washed space. Imagine a library, hushed and eerie, but instead of books, all the shelves are filled from floor to ceiling with rack after rack of circuit boards. That's called the frame. There are even rolling ladders, with signs that read, "Caution. Look up before climbing." Like what kind of doofus wouldn't look up before climbing?

Upstairs in the building, connected to all those wires, is the switch. The switch is the biggest computer you ever saw, and its job is to control every phone line in Astoria. When a phone-company customer in an apartment over the Tae Kwon Do martial arts studio on 31st Street wants to order a pizza from around the corner, the phone call travels on copper cables to the switch, which funnels it to the pizza parlor's line. Multiply that by a couple-hundred thousand lines in this part of Queens, and millions of phone calls a day, and you see what we're dealing with.

Now, if you or your friends knew how to program a switch, or even knew a password to log on to a switch, you could start exploring. Go deep enough, learn your way around, and you could be pretty powerful. Because then, you could control everybody's phone service. You could create an unbillable number for yourself or your friends. You could listen in on phone calls. And best of all, you'd really know how all this fabulously complex electronic circuitry works. That kind of omnipotence is beyond the ethical reach of the CEO of New York Telephone. But maybe not beyond the reach of some teenage hacker tenacious enough to scrounge around in the garbage until he finds a password.

This alone makes the trip worthwhile. For a carload of teenage hackers, the opportunity to gawk through the big plate-glass

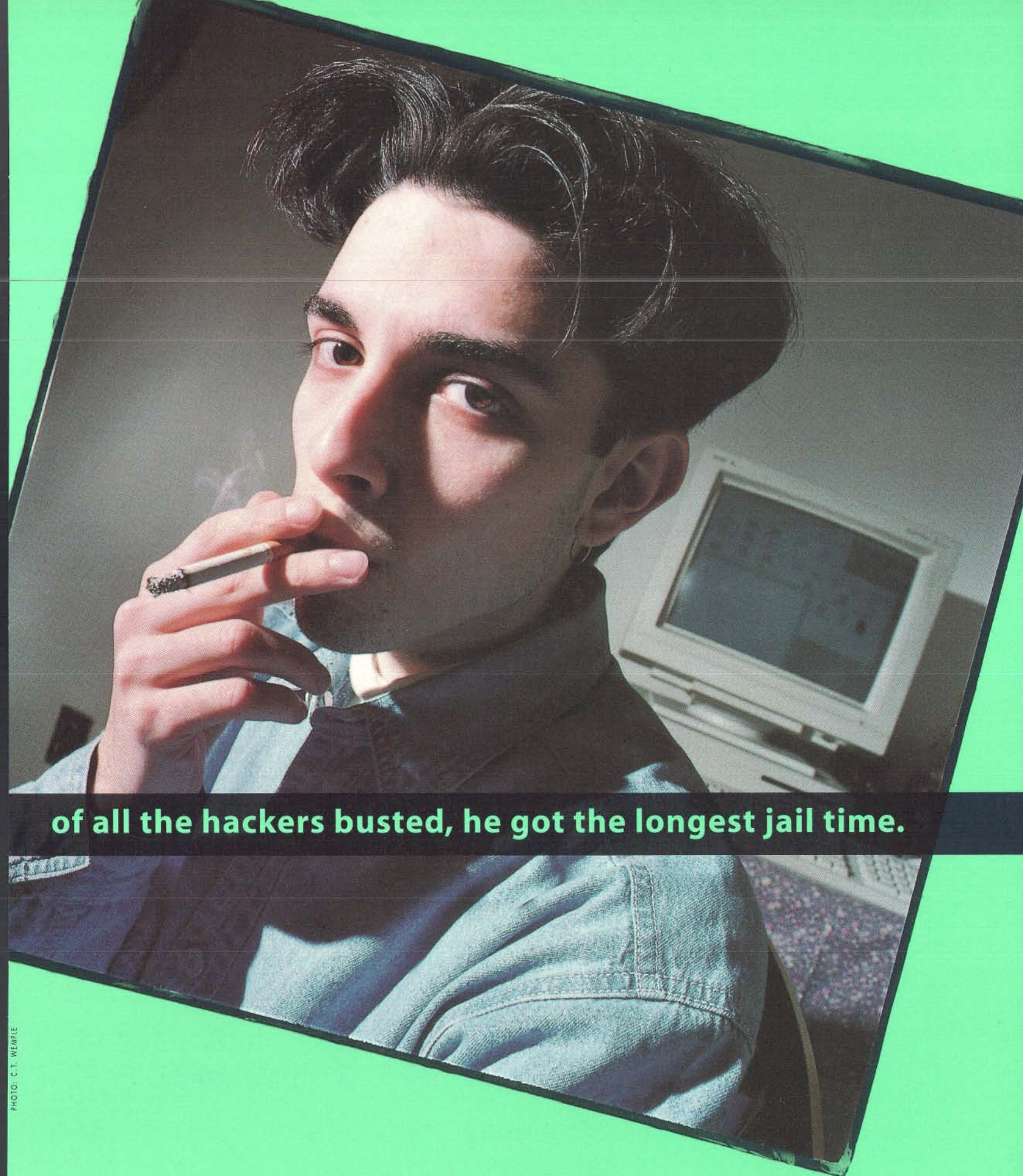
Lee's friend Phiber Optik got kicked out of the LOD;

"Let's go trashing," somebody in the back seat said. "There's a C.O. in Astoria." Paul finds it cool to be talking in a kind of hackers' code. The word "trashing" means climbing around in garbage, where you hope to find computer printouts that list secret passwords and logons. And C.O., as everybody in the Supra knows, means central office. As in New York Telephone's central office, in Astoria, Queens. Somebody broke out the Balantines and the Olde English 800s, and Paul took one. He knew only one of the other guys in the car - his best friend, who calls himself Hac. Until tonight, Paul had never physically met the driver, Eli Ladopoulos. But he had known him by his handle: Acid Phreak.

They reach Astoria, and even the building itself thrills Paul: this big, filthy, red-brick monster takes up most of the block. Across the front, chiseled over the door, it reads "Telephone Building." Like on a board game or something. Does the park across the street have a big sign that says "Park" over it? No way.

Windows at the matrix of electronic circuitry is better than being Dorothy at the gates to the Emerald City. These teenagers are not central casting's idea of computer nerds. Not a plastic pocket protector in the bunch, nobody squinting myopically through thick lenses. In fact, no one here wears glasses, and Paul and Hac, at least, are as muscled as the first-string running backs who graduated with them from high school last year. If they weren't so jumpy, they could toss around the 30-pound bags like Nerf balls. Look at Paul - he's the pale silent one. He's always quiet in a crowd. Because he's a big kid, his silence is intimidating, whether he means it to be or not, as he stands staring with

Michelle Slatalla and Joshua Quittner (quit@newsday.com) are both reporters at Newsday, in New York. They're married, have two daughters and a cat with six toes. This piece is a preview excerpt from Masters of Deception: The Gang That Ruled Cyberspace (Harper-Collins, 1995).



of all the hackers busted, he got the longest jail time.

flat, Slavic eyes. Those eyes take in everything and return nothing. Eli is his physical opposite. He's the one the girls like, the hip-hop guy, the cool one. Eli has a slow smile that starts like a conspiracy and spreads up to his eyes and pulls you in. His eyes are black as blueberries. His hair is as black as his eyes.

This is Paul's first time trashing, and frankly, if you knew him, you'd be shocked to see him here. He is, after all, the valedictorian of Thomas A. Edison High School's class of 1988. Winner of the all-city computer-programming competition. A boy with a future.

They start going through the garbage. Paul hoists a bag over his shoulder, over his head, and hands it up to Hac. Then Hac hands it down to the sidewalk. That's the routine, with Eli playing lookout on the street below. But just as Hac's about to hand off the final bag, a man comes out of the telephone building and pauses a second longer than he should. Then he gets into a car, rolls down

But it turns out that Eli is not talking about just any guy. This is the dude. Eli's talking about Phiber Optik, says he's even encountered Phiber while roaming through cyberspace. Eli's never met him in person (but then, who has?), but Eli knows enough about Phiber Optik to know that he's the man with the answers. He's in the Legion of Doom, isn't he? He's the gang's phone guy, for god's sake. The Legion's exploits are legendary. The Legion is rumored to know how to break into ongoing phone calls. The Legion is rumored to have hidden its own private bulletin boards inside corporate computer systems. The Legion's archives are rumored to be the repository for the best technical information in the underground.

Paul doesn't know anybody in the Legion of Doom, doesn't even know who's in it – though he's heard of the gang founded by a notorious hacker named Lex Luthor. Eli says that if Phiber Optik got into the Legion of Doom, then Phiber Optik must be good. You have to be a little brave to even suggest calling a guy like that. You

I D E N T I T I E S

Paul Stira (Scorpion). He chose his online name in junior high school after he cracked some software copyright protections. "This game cracked by Scorpion" sounded more glamorous than "This game cracked by adolescent in outer borough."

Mark Abene (Phiber Optik). Perhaps the best-known hacker of the late 1980s, and a true expert in telephone company arcana. He switched handles from *Il Duce* to Phiber Optik, an homage to that most capacious of information conduits, fiber-optic cable.

the windows, and just sits there. The boys freeze.

"What's he doing?" Paul whispers.

"I don't know. He's just sitting in his car."

Paul and Hac stand there, crazed alley cats, backs high; ears cupped, tensed on tiptoes. And then the worst happens.

In the distance, they hear a siren. It's not an ambulance, whose aural signature Paul would recognize. But it's definitely a siren, and it's getting louder. Closer. It's a banshee now, and it's just around the corner, and Paul, for one, has had it with the dumpster diving. He climbs over the fence, as fast as he can, and follows a retreating Hac to the sidewalk. The siren's just about upon them, and they dash madly across the street, bags in tow, past the guy who's sitting in the car, now wide-eyed, watching the kids come leaping over the fence. Their sneakers hit pavement, and with barely a second to spare, they dive into a dark, safe spot in the park.

Just as a fire truck blazes past.

They look at one another, their hearts pound. They can see the outline of the Triborough Bridge through the leafy trees. The green and white lights along its suspension beckon like a distant Ferris wheel, and it's an adventure again. They kneel on the handball court and rip the sacks open, and paper printouts spill like entrails. The night is hot and the streets are hopping and you can probably even see stars. They don't look up.

have to be pretty sure of yourself, not afraid at all that the guy is going to hang up on you, or worse, listen to what you say and then ridicule you. You have to have a lot of confidence in yourself.

"Let's call him," Eli says.

Paul says OK.



hat do you want?" the voice demands. "I'm Phiber Optik of the LOD."

If you heard it, you'd think it was the Wizard of Oz himself, standing behind his curtain and making steam hiss and fires roar. Phiber Optik of the LOD. Both Paul and Eli hear it, the outrage in the thunderous voice that has answered the phone.

Now, Eli once "met" Phiber Optik on a bulletin board. But that's little comfort now, not with a real live member of the Legion of Doom on the other end of the phone, thundering and aggressive. A guy like that doesn't like you, he can turn you into a toad – or at least turn your home phone into a pay phone. Every hacker has heard the stories, heard of some poor rodent whose mom picks up the phone in the kitchen to call Linda next door and instead of a reassuring tone hears the recording, "Please deposit 25 cents." Explain that to your mom. Not that Phiber's response is totally unexpected. How does he know that he's not talking to a couple of lame wannabes on the phone? He gets these calls all the time. Ever since word spread that he's in the Legion of Doom, his phone number has been disseminated in the underground.

What do Eli and Paul want of Phiber? It's obvious. They heard



few days later, Eli and Paul haven't given up; they're in need of an expert who can help them really navigate the phone system's computers. Eli says, "I know this guy..."

he was the dude who was into phone company switches. But that's the simple answer. They really want much more, don't they? They want him to teach them not only about the phone system, but also about all the sophisticated computers he's cracked, about the rare commands he can type, about the way his mind works. They want what any two boys with a little knowledge and a great curiosity want. They want a leader to show them the way.

Phiber loves to teach. "You want to get together?" he asks.

And Paul thinks, Who is this guy?

They soon learn Phiber's real name: Mark Abene.



There are wannabe cyber gangs, and then there are real cyber gangs, whose members crow and scrawl their proud graffiti over electronic bulletin boards. No gang is more real, more revered, than the Legion of Doom. Its founder is the legendary Lex Luthor—a mysterious leader who lives somewhere in the South. His protégé is a brash Texan tyro, who uses the handle Erik Bloodaxe, a name infinitely more memorable than his given name, Chris Goggans.

John Lee (Corrupt). The nickname was John's when he was in a New York City street gang known as the Decepticons.

Eli Ladopoulos (Acid Phreak). A playful double entendre on the word "freak," a phreak being someone obsessed with hacking the phone system.

The Legion of Doom is the best of the best from the 50 states. How does one become a member? It isn't like you have to prick your finger and swap blood with Chris Goggans. Gang members on the electronic frontier don't live in the same state, wouldn't recognize each other if they were standing shoulder to shoulder on the bus. Here's how Mark Abene got into the Legion of Doom in the first place. Although Mark swears he never spoke to Chris before joining LOD, here's how Chris remembers it (Mark, typically, says Chris is all wrong): one day a few months ago, down in Texas where he was a college student, Chris noticed that Mark Abene had started signing his postings, "Phiber Optik of the LOD." And Chris thought, Who is this kid?

He immediately phoned north.

"Hi, is this Mark?"

"Yeah."

"This is Chris—Erik Bloodaxe," said Chris. "Why in the hell are you signing your name LOD? You're not in LOD."

Mark thought for a second, then said solidly, "I'm in LOD."

"No one is in LOD unless we all vote on it," corrected Chris, who explained the "rules," among them the necessity of a unanimous vote.

Then, for some reason, the tone of the conversation shifted to what both teenagers really cared about: hacking the phone company. And Chris realized that Mark really did know as much as peo-

ple had been saying, maybe more. This guy was good.

The actual vote came a few weeks later. Mark was in.

Just like any schoolyard pack of boys born in the shadow of *The Dirty Dozen*, *Hogan's Heroes*, and *Mission Impossible*, the LOD members all fancy themselves specialists in some dark art. One kid might know how to make a wicked blue box, a device cobbled together from top-secret Radio Shack parts that simulates the tones of coins dropping into a pay phone. Another might be an expert in programming Basic. And Mark? He can trace the route of a phone call from New York to Paris, detailing in loving techno-babble each photonic hop. He can describe, in detail, the different kinds of computers that run different aspects of the phone company's business. He knows the meaning of the phone system's every English-language-mangling acronym: MIZAR, COSMOS, SAG, LMOS. He can explain the phone system to anyone. Indeed, he loves to, in eye-glazing, brain-fogging, overdosing detail.

And in 1989, Mark has just turned 17.

To tell the truth, a few members soon get a little sick of the new prodigy. He is brash and has what some out-of-state members rec-

Chris Goggans (Erik Bloodaxe). A Legion of Doom leader, based in Texas, he took his online name from a book he read in sixth grade about a race of Viking warriors with magical powers.

Scott Chasin (Doc Holiday). The hero of the Old West was always a favorite of LOD member Chasin.

ognize as New York attitude. And he doesn't give a rat's ass who thinks so.

If Phiber Optik graces a bulletin board with comments about this or that phone company secret, then other hackers spread the word: Phiber's on. This place is hot. A crowd congregates. The phone lines are all busy. Hackers desperately call, using the redial feature, trying anything to get through, trying to get past a busy signal as implacable as any nightclub bouncer.

Phiber seems to revel in belittling blustery hackers who post misinformation. He loves nothing better than trapping some nitwit who thinks COSMOS is some double-secret key to the phone company kingdom. (Duh, the name sure sounds important, doesn't it?)

People are starting to notice. Like Chris Goggans. One day in 1989, he and a friend, Dr. Who, are hanging out on a hot bulletin board called The Phoenix Project. Who do they run across but Phiber Optik of the LOD, eviscerating some poor pretender.

And this was what Chris thought about Mark: a real arrogant, smart-ass punk.



Mark and Chris never settle their difference. Mark gets kicked out of the Legion of Doom.

He has a disagreement with Chris, and Chris starts bad-mouthing him to the rest of the members of LOD. Word of 200 ▶

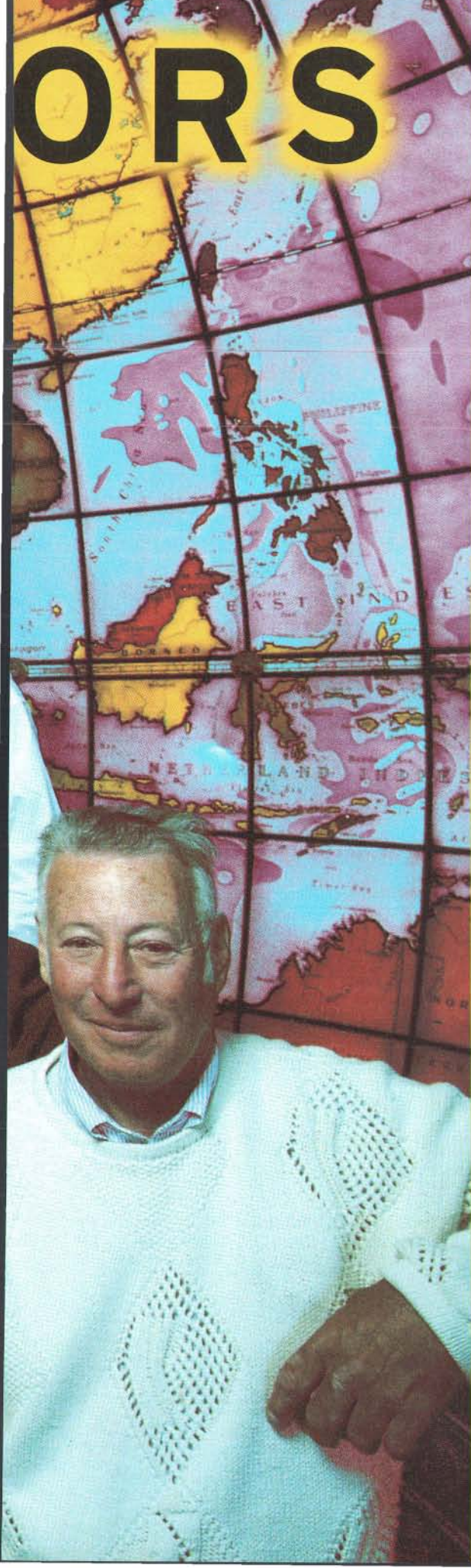
THE CREAT

Twenty-five years ago,
they brought the Internet to life.
By Katie Hafner

With an interview
of Vint Cerf
By Steve Cisler



ORS



CLARK QUIN

In September, 19 middle-aged men gamely crammed themselves onto a bridge at the Christian Science Publishing Society's Mapparium in Boston to pose for a photograph.

They were gathered to celebrate the 25th anniversary of the installation of the first node on the Arpanet, the precursor to the Internet. True to an engineer's proclivity to solve problems, even at the risk of seeming meddlesome, they couldn't help but offer some advice to the photographer, who was having a little trouble fitting them all in the shot: Try a different angle. Try a different configuration. Try a different lens. Try a different camera! The years haven't dimmed any of the invention and curiosity that drove these men to rig together the world's first real data network.

Bob Taylor (1), a psychoacoustician, was director of the computer research program at the Department of Defense's Advanced Research Projects Agency in 1966 when he hit upon the idea of linking computers together. By getting various research sites to share computing resources, Taylor figured he could save some money. Thus, albeit unwittingly, he ignited a revolution. Charlie Herzfeld (14), Taylor's boss at the time, was head of ARPA and keeper of the purse strings. He liked Taylor's idea and gave him US\$1 million to build a small experimental network.

Larry Roberts (4), a pioneer in computer networking at MIT's Lincoln Laboratory, was considered the only scientist in the country who could put the network together. It took Taylor more than a year to convince Roberts to move to ARPA, but Roberts finally agreed. He designed the original four-node network, which was to be based on packet-switching, as opposed to circuit-switching.

Wes Clark (7), a gifted computer scientist, came up with the idea for building a separate computer to handle the communications, called an Interface Message Processor. At the same time, computer scientists in the UK, including Roger Scantlebury (13), were also working on a data network. The Brits coined the word "packet." In 1968, Roberts and fellow ARPA administrator Barry Wessler (9) sent out a request for proposals.

Dozens of companies responded. IBM, however, claiming such a network could never be built, declined to bid.

Bolt Beranek and Newman (BBN), a consulting company in Cambridge, Massachusetts, won the bid, and a small team, led by engineer Frank Heart (3), set out to build the first Interface Message Processor.

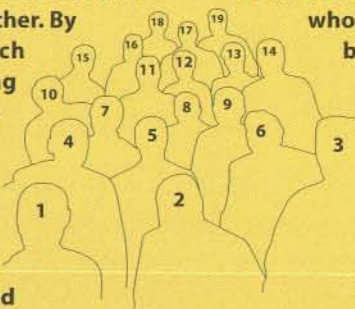
Other members of the group included Bob Kahn (6), a networking theorist; Dave Walden (10), a programmer; and Severo Ornstein (11), a hardware whiz who later founded Computer Professionals for Social Responsibility (CPSR). On Labor Day weekend 1969, the communications processor, built from a Honeywell minicomputer, was crated up and flown to the University of California at Los Angeles, which would ultimately become the network's first node. Ben Barker (15), another hardware designer, wrote "Do it to it, Truett" on the side of the crate. Barker's graffiti was intended for BBN engineer Truett Thach (12), who accompanied the processor by plane to California.

At UCLA, a group of graduate students - Vint Cerf (2), Jon Postel (16), Steve Crocker (17), and Bill Naylor (18) - worked on connecting the first Interface Message Processor with the university's host computer. The faculty member overseeing the project was Len Kleinrock (5), who ran the Network Measurement Center, which measured and controlled the flow of packets.

Doug Engelbart (8), later known for his invention of the mouse, worked at the network's second node, SRI International in Menlo Park, California, and ran the Network Information Center. Roland Bryan (19) brought up the third node at the University of California at Santa Barbara.

Postel would later write the first telnet program. Crocker chaired the Network Working Group, the first organized attempt to develop standards and protocols for the Arpanet and, later, the Internet. Cerf and Kahn went on to develop the Transmission Control Protocol/Internet Protocol (TCP/IP). They worked to get TCP/IP adopted as the undisputed standard among communications languages in the mid-1980s.

The rest, as they say, is history. ▶



In that short history, Vint Cerf is an Old One, a major character whom many consider the true father of the Net. He has been the president of the Internet Society, an international organization devoted to the continued evolution and spread of the Internet, since 1991.

The Internet has been viewed by some as an inspiring example of a postmodern, non-commercial economic success story. So it struck many as ironic that Cerf recently accepted the position of senior vice president for data architecture at tele-giant MCI. Steve Cisler caught up with Cerf to find out what the president of the Internet Society is up to now that he's an MCI vice president.

Wired:

How many users do you think there will be by the end of the decade?

Vint Cerf:
"300 million."

Wired: Why did you go to MCI?

Cerf: This was not an easy decision to make, but it was increasingly clear that MCI was really serious about building its share of the global information infrastructure. So in the end I agonized and agonized and decided, well, I've had seven years to fill up my research and development rain barrel, and it's time to go build something. R&D is a way to explore possible systems designs that can be used by real people. But you have to go into the business world to get enough resources to build production systems.

Would you say that MCI's vision of the future is different from, say, that of AT&T or Sprint or the Deutsche Bundespost?

I hope so. MCI certainly sees a very large vertical market—providing information services to particular business and consumer segments—in addition to the important horizontal infrastructure that has traditionally been, and still is, a dominant part of its service.

What are you doing with MCI on a day-to-day basis, and how is that different from what you were doing before?

I was doing research before—and experimentation. Now I am doing architecture for a world-class production information infrastructure. If I'm in town, and not traveling, I'm likely to be online for five or six hours, at least, just plowing through e-mail. I also rely on things like gopher, WAIS, and the World Wide Web.

Do you run into congestion when you're cruising the Internet?

Yes, all the time. I think what this tells us is that we have to learn how to find ways to distribute the load, especially for tens of millions more consumers.

How many users do you think there

will be by the end of the decade? 300 million.

That's a lot of growth. Is MCI thinking about how the Internet impacts its core business of long distance?

The Internet is really like basic telephone dial tone, but for computers. It has, in addition, many value-added services that lie atop the basic communication-service infrastructure.

But how does MCI plan to make money on Internet services? Will MCI become an Internet service provider and compete with the likes of Netcom and The Little Garden?

It's possible. MCI is already helping companies build private internets using a variety of switched- and private-line services. MCI is also involved in the public Internet, supplying a variety of underlying services to many Internet service providers worldwide. Local service providers and regional service providers need long-distance parts of the Internet.

While MCI is not in the business of providing bandwidth for free, and millions of new users mean lots of demand for new bandwidth, do you agree with techno-pundit George Gilder that bandwidth eventually will become free?

I don't agree with Gilder. All Internet service providers ultimately have to recover the costs of providing service, including the long-distance parts. It really does cost something to install, maintain, and operate wide-area networks, and the costs must be borne somehow. They may be so widely spread, however, that they may seem free to users sharing the costs.

Too much popularity can kill a site. Do you see this as a problem?

Yes. That's why I think electronic publishers will survive as providers of capacity for online service and as editorial quality-control filters, as in the print medium. It wouldn't surprise me a bit to find people putting up servers for third-party information. That's no different than what CompuServe does.

But right now there's no easy way for me, at the bottom of the information food chain, to be reimbursed by somebody like a publisher at the top who might be making money off of my information. Is there a way to repair this?

Yes, several ways. New methods for capturing transaction data and providing compensation for information are under consideration in the Internet community on an experimental or pilot basis. Many publishers are starting to experiment with delivery of

information on the Internet on a compensated basis.

Of course, CompuServe, America Online, and Prodigy, to name three, are examples of services that provide access to information for a price. Building free and compensated information services into the Internet is an important aspect of making the Internet an effective business and information tool.

What other Internet-based problems are you trying to solve?

More than 50 percent of registered networks are on the Internet and the rest are private. They have concerns about protecting, broadly speaking, all of the assets that their host companies had on their internal network. Recently I have been thinking about new architectural features for the Internet that allow a kind of semipermeable membrane that lets the company put some of its assets in a private setting, so that they're only accessible to other parts of the company or some discretionarily selected group. We still have to find ways of distinguishing between access points.

Do you find this huge recent interest in the Internet surprising?

I have parents come to me and say, "Oh, I just got online, and I can talk to my kids! They are at school and on the Internet, and that's the only way I ever hear from them." They tell me their extended family has been knit together because they are all networked. The thing that I personally found surprising is that the Internet used to be a kind of neat, private thing within this little community, and now all of a sudden the public is here. All of a sudden we ain't special anymore.

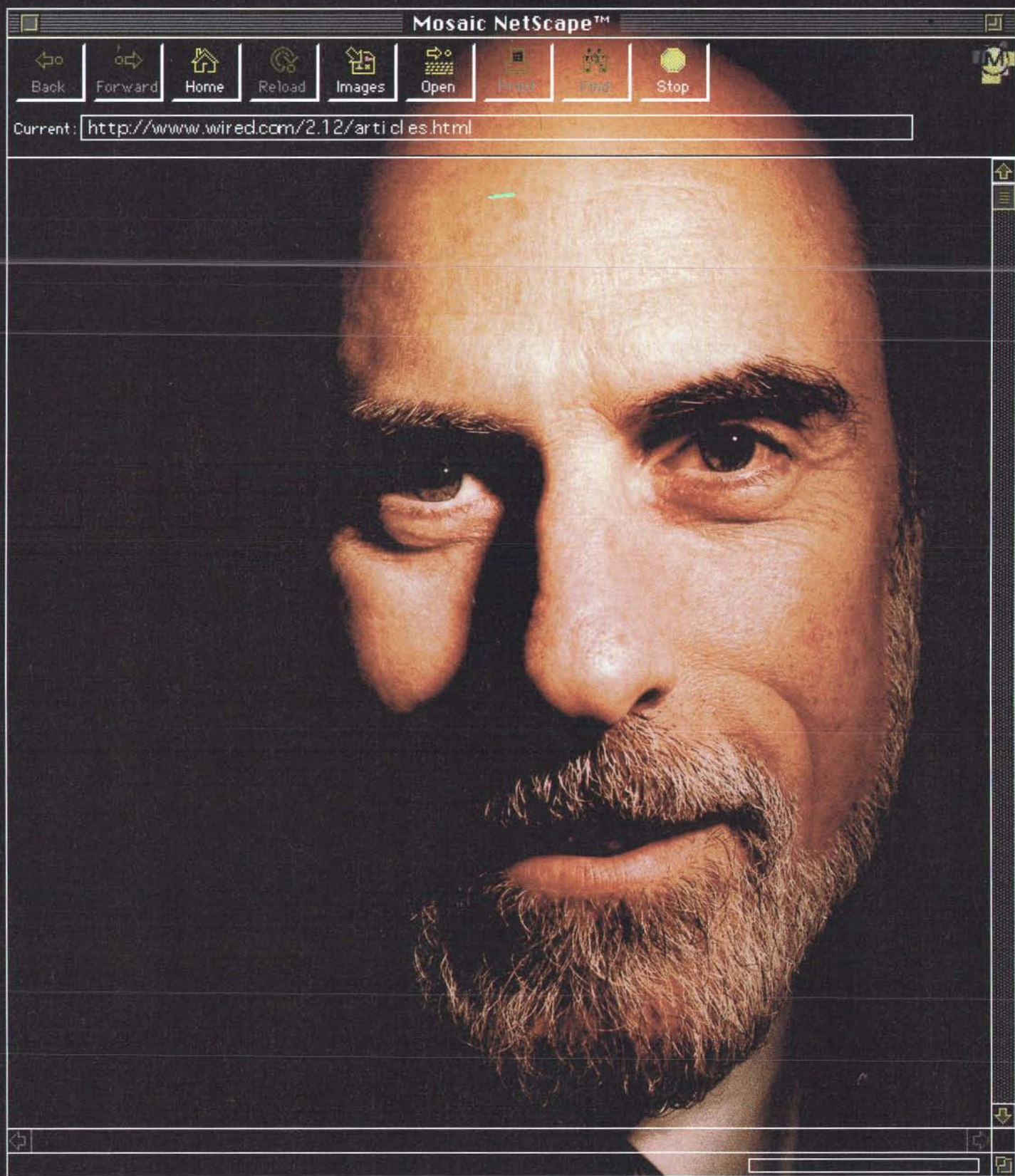
How is the Internet now different from what you thought it would be in the beginning?

It was supposed to be a highly robust technology for supporting military command and control. It did that in the Persian Gulf War. But, along the way, it became a major research support infrastructure and now has become the best example of global information infrastructure that we have.

If you had to do the protocols over again, what design changes would you make?

I'd make a much larger address space!! ■ ■ ■

Katie Haffner (katieh@bga.com), coauthor of Cyberpunks, is a former staff writer at BusinessWeek. She is writing a book for Simon & Schuster on the history of the Internet. Steve Cisler (sac@well.com) is a senior scientist in the library at Apple Computer Inc., in Cupertino.





Ceci n'est pas un ordinateur

Brook Meinhardt

Digital technology is eroding not only the foundation of

the elite contemporary art world – the museum and gallery system –

but the very concept of art as commodity, threatening to make the overheated art

market of the '80s seem like **the last gasp of tulipomania.**

At the same time, it is offering artists the possibility of escaping from the increasingly

esoteric discourse of the art world, reintegrating their work with

larger issues related to science, technology, and humanism, and creating

the Second Renaissance. By Daniel Pinchbeck

The physicist Werner Heisenberg and the assassin Jack Ruby sing to each other from beds anchored to the surface of the moon. Their songs describe a collaboration: working together, they are trying to build a nuclear bomb, a maze of metal pipes and fuel rods that slowly assembles itself, on the bleak lunar landscape, around the aging scientist's bed. This is just one of the scenes in artist Ronald Jones's *Petrarch's Air*, a virtual reality opera that the Brooklyn Academy of Music intends to transform into an actual production in 1997. Like the works of avant-garde spectacle-maker Robert Wilson, Jones's opera will turn a collage of historical fact and poetic fantasy into an allegory on contemporary life.

Sitting in front of a PowerPC in his immaculate SoHo loft, Jones flies me through the sets and acts of his new creation. "No one has ever envisioned an entire opera through a computer before," he says. His general demeanor shows the effects of having spent drawn-out days and nights fixated by his terminal: a heavyset man in his 40s, he has long scraggly hair and several-days' worth of stubble. "Until I began working with computers, I had never given opera a thought. Now I think that opera is made for virtual reality and vice versa."

Daniel Pinchbeck (danielp@echonyc.com) is a New York-based freelance writer and editor of Open City, a literary and art journal.

Three years ago, Jones had never given computers a thought, either. He was, at that time, a successful conceptual artist and a "card-carrying" member of the elite contemporary art world. For those unfamiliar with its workings, this milieu can appear to be something of a cult, a network of insular museums, galleries, critics, artists, and wealthy collectors. It is a world of cliques and subcliques, whose language is the jargon of critics and theorists, the "artspeak" found in magazines such as *ArtForum* and *Flash/Art*. This international community doubles as a distribution system for what is often called advanced, or avant-garde, art. Only a handful of the art world's chosen few – a group that includes artists such as Jenny Holzer and Jeff Koons – have managed to become famous beyond this small coterie. The art world's specialized nature turns off many outsiders and commentators. *60 Minutes*'s Morley Safer devoted a television segment to ridiculing it; virtual reality pioneer and artist Jaron Lanier considers himself part of it, but also describes it as "that thing that I think should die."

This clique, whose very exclusivity defies the name ("the art world") that it bears, expresses condescension toward "computer art" up until the end of the 1980s, when an awareness dawned that growth of digitally-based media may in some ways threaten the structure of the museum and gallery system.

**Painters should
compose their
works, said Alberti,
as if facing "an open
window through
which I see what I
want to paint."
Is it coincidental that
the most common
graphical interface
for computers today
is called Windows?**

"The art world is scared to death of this stuff," says Laura Trippi, a curator at the New Museum of Contemporary Art, a SoHo establishment that showcases the cutting-edge in artists and ideas. "We are seeing a breakdown of the art object which reflects the fact that the field of fine art is itself breaking down."

Digital art is the apotheosis of art in the age of mechanical reproduction. The very distinction between original and copy becomes meaningless in a digital world – there the work exists *only* as a copy. And yet, artists, like the rest of us, remain uncertain as to whether the new information universe is merely an impoverished shadow of some other, more corporeal reality.

Taking advantage of this uncertainty, a number of Jones's contemporaries have appropriated computer technology for work that conforms neither to technoutopian visions nor to art-world commonplaces. For example, a group of artists have started their own BBS called *The Thing*, inspired by German artist Joseph Beuys's idea of a "social sculpture." With nodes in Cologne, London, and New York, and a small, exclusive membership, *The Thing* envisions itself as a work of art.

Today's radical artists are stuck smack in the middle of a classic 20th century artistic dilemma: how to remain disassociated from corporate pressures while at the same time succeeding within an art establishment that is dependent on corporate and institutional largesse. The digital revolution has sharpened the point of this problem, since the tools of digital culture – rendering programs, photo and video applications – are developed in the context of commercial art.

Anybody who has visited the art galleries at industry shows such as Seybold knows how distant the workaday core of the digital community is from the rarefied atmosphere of New York's Whitney museum. And yet, a number of artists on the fringes of this culture, especially young artists of the rave/neo-psychedelic scene, are twisting digital tools to serve their own evolving personal visions. Conceptual artists such as Jones, Perry Hoberman, or Laura Kurgan come at the same problem from the other direction, by appropriating digital tools.

The digital revolution may eventually blur the boundaries between radical and commercial art. On the Internet, communal aesthetic forms have begun to surface. The dream worlds of MOOs and MUDs, for example, allow users to create their own content. Net surfers around the world are exploring – and inventing – this new terrain.

The art market has greeted this emerging culture with a certain anxiety: how to use it, how to embody it, and how to sell it. Jones reflects this anxiety in *Petrarch's Air*, whose title alludes to the Renaissance poet Petrarch. He thought, Jones says, that he could learn Greek by always carrying Greek books with him, although he never opened them.

Osmosis may have sufficed for the Italian poet, but it's hardly adequate when it comes to learning new technologies. Jones is staking his future on his ability

to actually crack those books himself and adapt his work to a shifting techno-cultural landscape. "There is an ever-growing gap between those disciplines that are comfortable with advanced computational tools and those that are not," he says. "It is like the separation between the First and the Third Worlds. I worry that the art world is going to be on the wrong side of that gap." Jones is determined to fight his way to the right side.

The Disappearance of the Art Object

Historically, the existence of the art world has relied upon the immense value accorded to paintings and sculptures as precious and irreplaceable commodities. Sure, the art market may have seen its peak in 1990 when tulipomania drove the price of a van Gogh at auction to US\$82.5 million, but a work by Jasper Johns or Cy Twombly can still sell for hundreds of thousands of dollars.

"The art world maintains a bias towards the notion of handcrafts," says David Ross, the director of the Whitney Museum of American Art, whose 60-year mission has been to build the nation's definitive collection of modern and contemporary works. "People want to buy objects that are shaped in some way by the hand of the artist."

Certainly, digital artists aren't the first renegades who have tried to crack the art-world oligarchy. Conceptual and Minimalist artists of the 1960s also attempted to critique art as supercommodity. When Carl Andre unveiled a piece consisting of a stack of bricks, when Lawrence Wiener pinned a note to the wall stating that his work "need not be built," they were attacking the sanctified aura of art. Andy Warhol lampooned the idea of originality itself with his Brillo soap-pad box and Campbell Soup paintings, substituting an impersonal, mass-produced aesthetic for the artist's individual "style." Yet the art market co-opted their efforts: ultimately all of their pieces could still be sold as originals or collectibles to museums or private patrons.

But a work created through a computer leapfrogs over these archaic notions of originality, commerce, and style. Today, many artists see digitization as far more than just another tool like a new printing press. "A computer is a device that can simulate anything, including itself," says Gregory Rukavina, an artist who is equally versed in the latest trends in technology and continental philosophy. "The material of traditional art has disappeared." A digitized artwork has no intrinsic status as an object, as it consists only of information that can be molded into a picture, a sculpture, an animation, or any other imaginable form. Any particular version of a piece can only be arbitrary, transient, accidental. Digital art is no longer object-oriented. So what has it become instead?

Whether they are exploring virtual reality, 3-D modeling programs such as AutoCAD, bar-code wands, or a new Internet browser, artists working in this medium are searching for such definitions. Peter Halley, a painter whose abstract, hard-edged images



paul davis



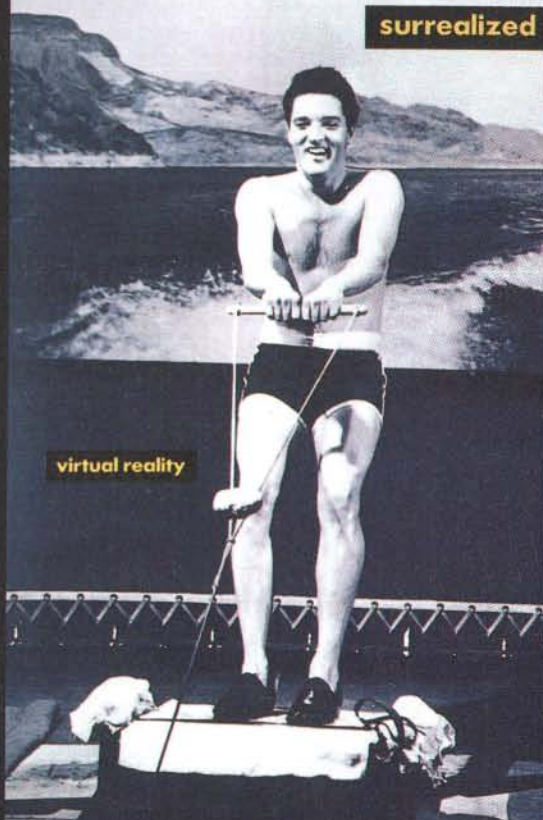
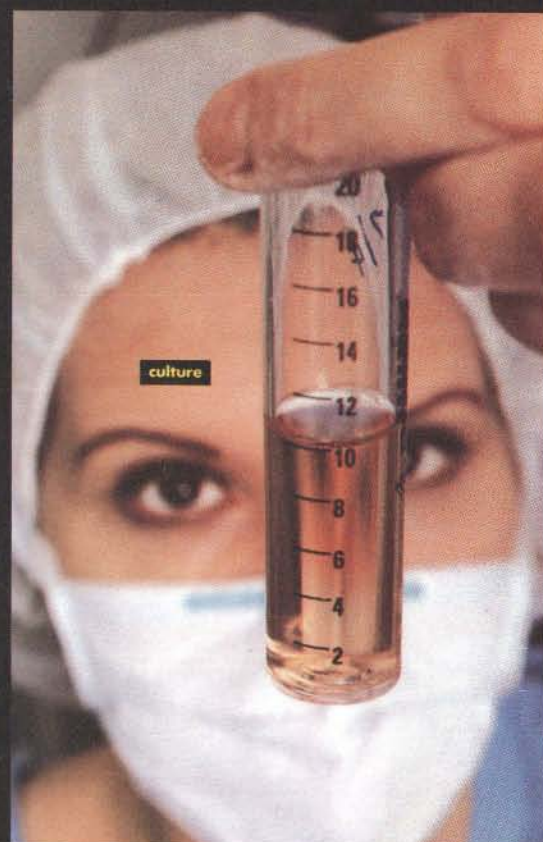
During the short history of design, only a handful of designers have dared to walk the tricky line between art and commerce. And even fewer have handled this unnatural balancing act with the humor and integrity of

The visionary design work of Dan Friedman.

From his legendary apartment-cum-design-laboratory in Manhattan, Friedman has devoted an entire career to breaking down separations: between art and design, teaching and practice, high and popular culture. In the process, he influenced a generation of designers—including the makers of this magazine. (Dan and I first met when we worked together at Pentagram New York in the late 70's.)

Friedman created the poster shown here in 1990, for an exhibition entitled *Artificial Nature*. Both the poster and the book accompanying the exhibition were seminal works—early warning signals for the eerie confluence of technology, design, and culture that the rest of us are only just beginning to experience.

Friedman's work has now become available to a wider audience with the publication of a 223-page retrospective. *Dan Friedman: Radical Modernism* (US\$65) is published by Yale University Press: +1 (203) 432 0947. — John Plunkett



Free Radical



artificial intelligence

packaged

hyper human



computer simulation

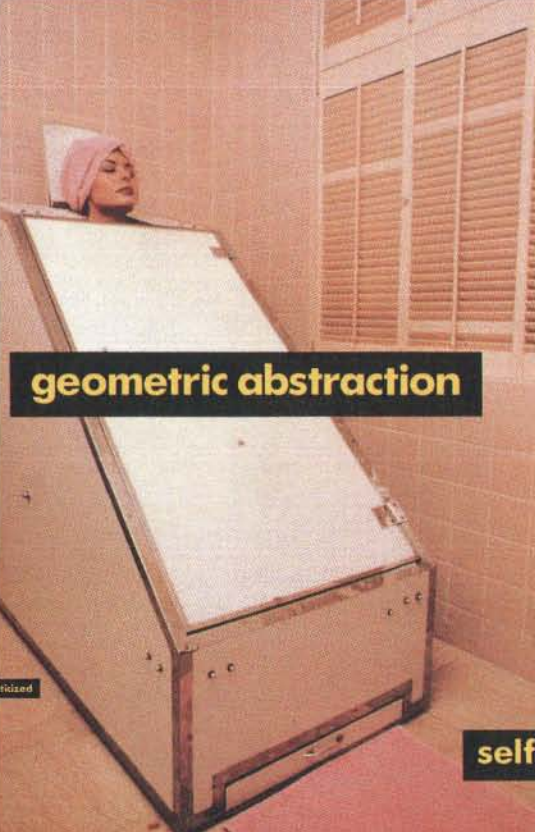
genetic engineering

post-natural nature

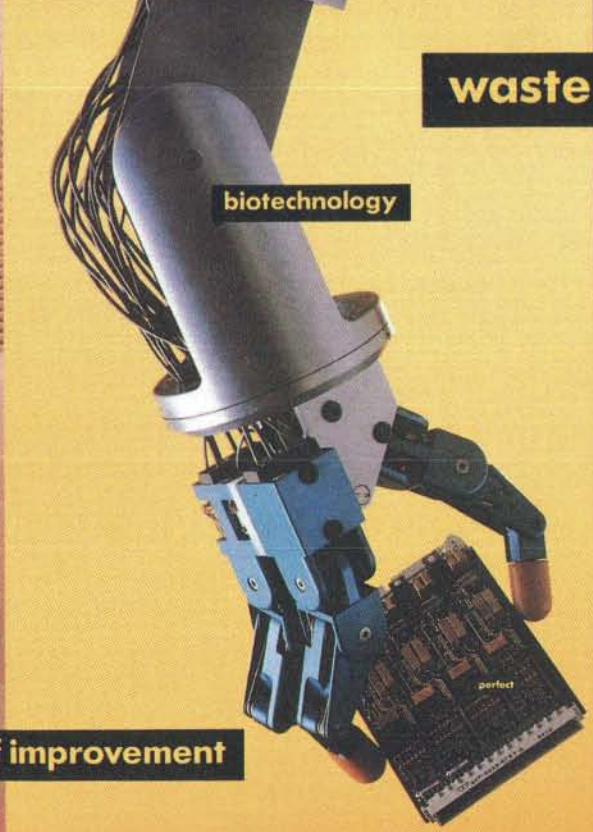


fantasy

radical spirit



geometric abstraction



biotechnology

waste products



mutations

self improvement

end.



**The transition
from government monopoly
to private competitor
has been difficult for Japan's
largest company.**

But necessary.

**An interview with the
president of
Nippon Telegraph and Telephone,
Masashi Kojima.**

NOT PROBLEMS, OPPORTUNITIES

By Izumi Aizu

Today, almost 10 years after the privatization process began, NTT has yet to win full independence for itself. The Japanese government still owns more than 65 percent of the giant corporation – 220,000 employees, ¥6 trillion (US\$60 billion in sales) – its tariffs are still regulated, and it needs the approval of bureaucrats at Japan's conservative Ministry of Posts and Telecommunications for many of its activities.

But lately NTT has begun to pick up speed. In May the corporation beat off an attempt by bureaucrats to install one of their own as president, opting instead to reelect NTT's current president, Masashi Kojima, for a third straight two-year term. Now Kojima faces a formidable task: with revenues from NTT's conventional enterprises taking a hammering from new commercial rivals, he must aggressively seek new business.

NTT has embarked on an ambitious project to build a ¥45.4 trillion (\$454 billion) nationwide fiber-optic network by 2015. Trials of potential multimedia applications for the new network began in September. At the same time, Kojima has shocked NTT's domestic suppliers by signing a string of alliances with US firms like General Magic and Microsoft Corporation. NTT's president has realized that the rules of the game have changed. The question is, will he be allowed to make the most of the opportunities that the changes bring?

Wired asked Izumi Aizu to find out. ►

Wired: It's been 10 years since the privatization of Japan's telecommunications market. What have you learned? What remains to be changed?

Kojima: Privatization was originally intended to spur a move from a telephone-only society to a new communications era. The result was price competition in the long-distance telephony market, which used to be based on cream skimming. This change was good for users – they got lower prices – and it was good for NTT. We had been relying on our monopoly situation for so many years, we had grown a bit complacent. It certainly prompted our reengineering efforts. But with the recent emergence of multimedia networks, the current Japanese regulatory framework may no longer work. No one can predict what is going to happen in the multimedia business. I want our government to have the boldness to change the regulatory framework, especially the sort of regulations that constrain new services.

We are in a primitive stage of capitalism, and the strongest contender is going to win. If you lose, you're out of the business. In the United States, there are entrepreneurs staking everything on a single technology or single service. Very brave. That's the US industry's source of strength. We can learn from that spirit.

Last year you often mentioned that NTT was far behind in the process of innovation, especially in the field of networking new digital and intelligent terminals and related software.

Last year we were far behind the latest trends of the digital, multimedia revolution taking place mainly in the personal computing and communications areas. Today it's much better, however. After examining our own technical strength in the communications field, we found that when it comes to the underlying technology of the network – especially major trunk lines with high bandwidth transmission capacity – NTT is still rather advanced. But we need to provide these higher capacity and higher speed lines from the switch to the users' homes or offices. Financing is the real challenge. Here, the "if we build it they will come" model may no longer work. Most customers are satisfied with conventional telephony; they don't want advanced services to be funded by their telephone bill.

We need to significantly lower the cost of building fiber-optic networks to the home, make it as cheap as existing copper lines. And we need to educate our customers about the benefits of these new services so that they support funding them through the conventional telephony business.

Last year you invested in Thailand to help build its domestic telephone networks. What were your goals in making that investment? Do either international cooperation or international aid play into it?

No. We are thinking in terms of purely commercial, business relations. Neither "friendship" nor "international cooperation" can be an excuse for not making a profit. These new ventures are very important strategically for us. The mobile telephone market in the US also seems attractive. That's why we decided to invest in Nextel in January 1994. (NTT's investment of \$75 million gave it a 1 percent share in the US cellular telephone company.)

Izumi Aizu (izumi@glocom.ac.jp) is the author of Network Evolution, published only in Japanese, and the translator of Howard Rheingold's Virtual Community. He works at the Center for Global Communications in Tokyo.

In the United States, there are entrepreneurs staking everything on just one single technology or a single service.

Very brave. That's the US industry's source of strength. We can learn from that spirit.

Last year we were far behind the latest trends of the digital, multimedia revolution emerging in PCs and communications. But today we are doing much better. Financing is the real challenge.

Despite its size, NTT has not entered the international market. Why not?

NTT is not allowed to enter the international market because of regulatory constraints. Domestic and international communications have been divided into two separate entities since before World War II. Now there is no reason for that. But to be frank, we are not worried. The market for international communications from Japan is around ¥300 billion (\$3 billion) per annum. By comparison, NTT's domestic market is ¥6 trillion (\$60 billion). But we know that in the future the world market is going to be more seamless. Government regulations do not allow NTT to go into long distance between two countries, but we can enter domestic service in other countries. When circumstances allow, we want to do that. We also expect to gain some new benefits through aggressive alliances with strong, innovative companies from overseas. They are also interested in our network technology. This year we invested in General Magic, and we have business alliances with Microsoft and Silicon Graphics as well. By making strategic alliances with companies from the US and Europe, we should be able to come up with cooperative products that can be sold in the world marketplace. Then we need to expand the market for these new products. We are ready to help developing countries build strong, functional communications infrastructures.

Other major Japanese industries – automobiles, electronics – have been very aggressive in the international market. One could argue they've gained expertise and resources by doing business in foreign markets with fierce competition and difficult conditions. Do you feel NTT has missed out on that experience?

Yes, the Japanese telecommunications industry, as well as the government, has been very slow to recognize the importance of competition in foreign markets. One reason is that the domestic market has been very lucrative. Another may be that while we have been a world leader when it came to technological innovations, we have not cared as much about service innovations. There has been significantly little strategic discussion about how Japan as a nation should cultivate the information and telecommunications industry as a core resource for global business. As for NTT, the regulatory framework that prohibits us from going to international communications can be considered as one factor.

If regulations are changed, are you interested in becoming a major player in carrying traffic internationally between Japan and the US, for example, or between Japan and Europe?

No, we don't want to become an independent international carrier of that kind. We need to have strategic alliances and partnerships to offer seamless services to our customers globally, however.

Earlier this year US Vice President Gore gave a keynote address at the Development Conference of the International Telecommunication Union in Buenos Aires, calling for a global information infrastructure. He said that by deregulating and privatizing the telecommunications markets in developing countries, private investment will be rewarded by a growing market economy, thus providing market opportunity for developed countries and economic growth for developing countries. Do you agree with this happy marriage?

Neither "friendship" nor "international cooperation" can be an excuse for not realizing a profit. These new ventures are very important strategically for us.

Basically we have a similar idea. But in actual cases – like our 209 ►

Microsoft's CEO is an intense guy. He rocks back and forth when he speaks, especially when he gets excited. He rocked a lot recently during this brief discussion with Wired's editors in his office in Redmond, Washington, about communications, education, and the economy.

Wired: How does Microsoft fit into the information highway?

Gates: I hate the term *information highway* – because it implies distance when this is all about getting rid of distance. And it implies that the government should build this thing, and I don't happen to think that's wise or necessary. The government does have a role: it's to clear the way.

Every year you pile up some books and take two weeks off to think. Your "think weeks," you call them. How do you decide what to take?

When I go away to think, it's about the future. I have about four boxes of stuff I take. This time I took about 80 non-Microsoft CD-ROMs to my hide-out, which is about an hour away. I was looking at CDs like *The JFK Assassination* and *Ancient Lands*.

So what did you learn?

There are basically two domains where you can look to get a clue about the future. One is what I call low-bandwidth interactive: online services and the Internet. The second is high-bandwidth, the sort of bandwidth you get with CD-ROM, which is much faster than anything you get from online services. Too many people are having this big debate about whether the future in home devices is going to be more like the PC or the TV. The answer is you're going to have both; people will have networks in their home, and the TV and PC will be some of the many peripherals on that network. The questions you need to ask are, What percentage of time will you want to sit in front of your PC? What percent passively watching your TV? And, When you're watching your TV, are there many people there, and if there are, what sort of interactivity do all those people want to share with each other *and* the TV?

Do you agree that the future of this vision is in the hands of the cable TV and phone companies?

The information highway is a tool of the individual. Individuals decide computers are fun

and exciting tools. No corporation is going to write a big check to put PCs into everyone's homes. There's so much hype about all these interactive pilots. Until a pilot comes along that has all these great applications that just blow everyone away – where you have people saying, "Where can I get this thing?" – you're not even at the starting line.

When new digital technology emerges, people want a standard to latch onto.

When you're trying to develop standards, bigness helps. That must put Microsoft in a good position, yes?

I'm not sure about that. First, Microsoft isn't big at all when you compare us to AT&T, TCI, Sony, Matsushita, or really any of the large telecommunications and media conglomerates out there. Even if you do consider us big, you have to ask how much bigness counts. Were Nintendo or Sega large companies when they established their systems? I'm not aware of any recent operating system that was established by a large company. AT&T had Unix. How'd they do? I don't think size has anything to do with this. Look at the Internet – it's a fine example of something

ROCKIN' WITH

MR. BILL



that thrived because it refused to be standardized. New protocols like those behind the Web came along and people downloaded them because they liked them. Most of the software that runs on the information highway will be written by smaller companies.

Do you have a sense of how the omnipresence of technology might change the way we understand and interact with government?

When you get revolutionary new communications tools, inevitably you're going to have people who will be as brash as to say we ought to reconsider how society gets together to make political decisions. But I happen to think the US government, on balance, is very good. What should the government have done about the PC industry when that revolution occurred? I have a very biased answer: it did exactly the right thing – that is, it did basically nothing. Now we don't have that choice. Government has to unleash communications companies for "information at your fingertips" to be realized. But in the early stages – in the next three or four years – I

think government should err on the side of doing less. You can really choke things and hurt the whole technological process if you try to guess and regulate in advance.

If you had a magic wand and you could grant yourself one wish, what would it be?

More people. We need more Dave Cutlers, Jim Allchins, Rick Rashids, or Craig Mundies [Microsoft employees all]. Give me a hundred more people like that.

Five years from now, in 1999, when we walk into our wired homes, where will we see the Microsoft logo? On our TVs and telephones?

You won't see our logo if Microsoft is providing the plumbing, the stuff underneath. You don't see the logo on water pipes, and you don't care. Speech and handwriting will probably be important in five years, and we'll be one of many, many companies trying to develop a good front end for network services. That's where the company name may show.

So is Microsoft planning on staying big by branding products at the applications level, or will you start going into what

you're calling the plumbing?

We're everywhere. MS-DOS, which was one of our most successful products, is really much more in the plumbing category. But I'm not sure you'll see us advertising the back end the way plumbing companies like AT&T and MCI are. These guys are spending millions of dollars advertising, and I have no idea why they're running those ads. It's part of the mania.

Manias happen all the time. What's new this time?

One thing about this revolution that's different from the PC revolution is that we think it's even bigger than the last one. And a lot of companies that will be huge players are ones you haven't heard of or that don't exist yet.

Do you have any ideas who they may be?

Microsoft is – and will be – important, but my point is that it's hard to predict this stuff. Say you'd been around in 1980, trying to predict the PC revolution. You would have been interviewing Ken Olsen at Digital. You would have been talking to people at Hewlett-Packard and Texas Instruments. You never would've come and seen me. ■ ■ ■



He's one of a new breed of
musicologists and educators.

A Crazy Shade of Winter

His Beethoven's *Ninth*,
Mozart's "Dissonant" Quartet,
and Stravinsky's *Rite of Spring*
are probably the most substantial
and satisfying CD-ROMs ever made.

Now he's about to
take on rock and roll.

By Ray Sawhill

Photograph by Henry Blackham

Robert Winter is not out for a lazy country drive. He's changing lanes as often as staying in them. He outguns one driver, noses in front of another, rams to a stop, then blasts off again. All the while, this hyperanimated, goat-teed figure – he has Frank Zappa looks, minus the built-in satire – is babbling excitedly, free-associating, cracking jokes, telling indiscreet stories.

This is a distinguished music professor? A former head of the University of California at Los Angeles music department? A *classical music scholar*?

Well, certainly not your traditional example. Winter is part of a new generation of scholars who are reinventing music studies. Adoring the tradition of Western music while despising the hierarchical thinking that makes a monument of it, he's a fire-breathing reformer with scathing opinions about what he calls the "music-appreciation racket." His head's as full of Middle Eastern music and Tupac Shakur as it is of Schubert. When he teaches a survey class, "The Art of Listening," he brings local performers – from rappers to string quartets – into the classroom with him. It's one of the university's most popular courses; students not only fill the 565 seats in the hall but also jam the aisles.

At the same time, he's among the first masters of multimedia. His CD-ROM programs – on Beethoven's *Ninth Symphony*, Mozart's "Dissonant" Quartet, Stravinsky's *The Rite of Spring*, and, most recently, Antonín Dvořák's *From the New World* symphony – are knockouts good enough to justify the purchase of a CD-ROM setup. These are some of the most satisfying discs Winter's publisher, The Voyager Company, has produced.

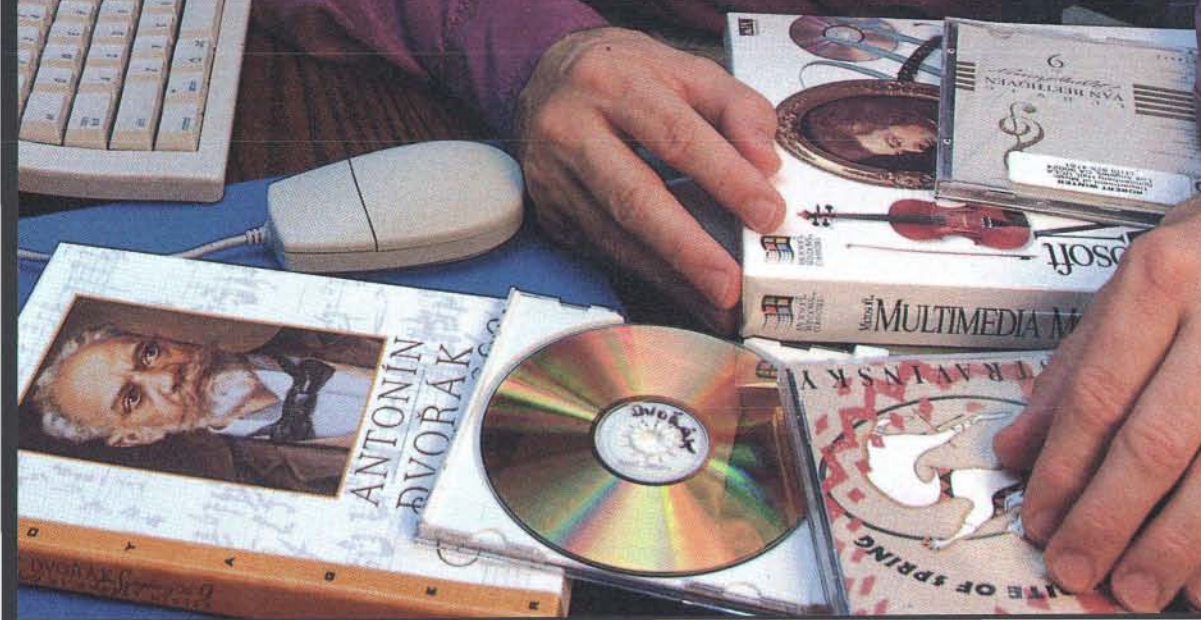
Recently, Winter decided to make a run at digital mogulhood. He reduced his duties at UCLA and informed Voyager's Bob Stein that he was splitting to form his own company with Jay Heifetz, the marketing/distribution executive and son of the legendary violinist Jascha. The new company will be called Calliope Media – "We swore we wouldn't be part of a company with the words 'digital,' 'technology,' or 'interactive' in its name" – after both the Greek muse of epic poetry and the steam-driven, wheezy musical instrument. Their vision for Calliope? "We want to be the premier arts and humanities company in the digital world," says Winter. "No less. I've too



Ray Sawhill is a staff writer for Newsweek.



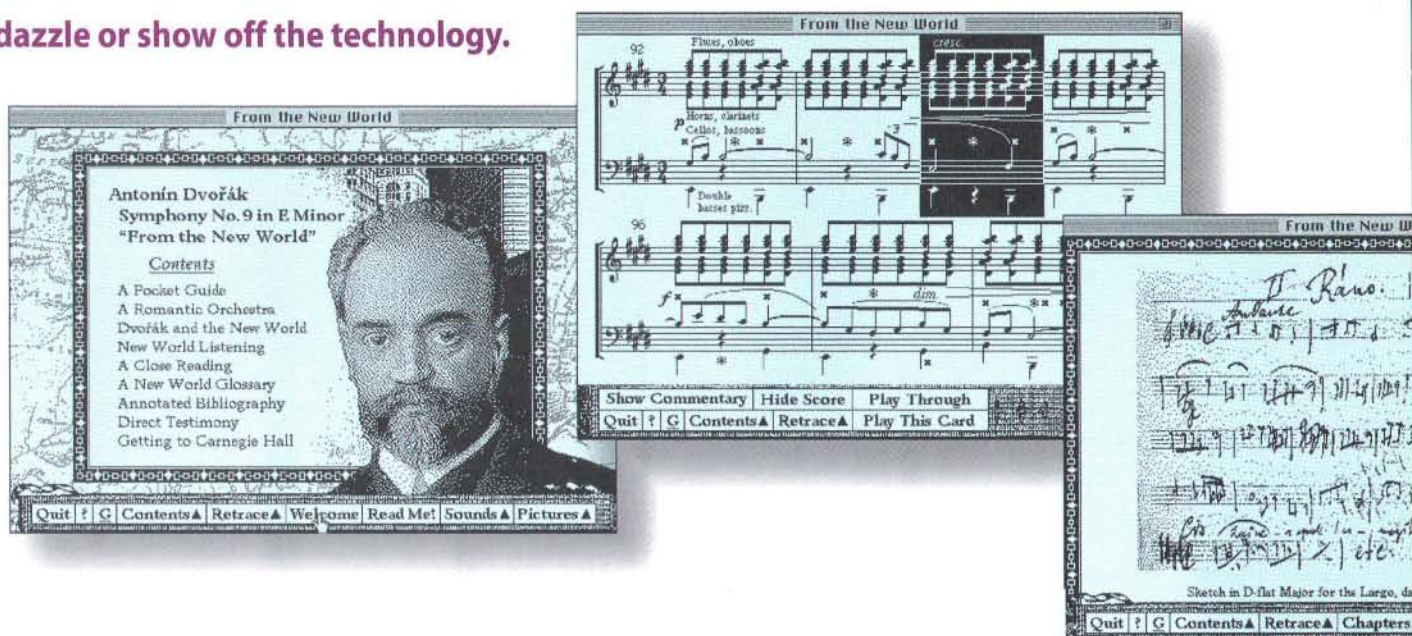
**"We want to be the premier arts and
humanities company in the world. No less."**



What makes Winter's CD-ROMs stand out

is the way his mind and the technology synchronize.

He isn't out to dazzle or show off the technology.



often heard Voyager spoken of as appealing to a niche market. We hope to persuade people that the arts and humanities aren't desserts but main courses."

Winter and Heifetz anticipate that their first titles will become available in late 1995. Among them: one by Winter on ragtime, and another by Richard Lanham, author of *The Electronic Word*, on the roots and evolution of multimedia and interactivity, tentatively titled *From the Greeks to the Geeks*.

What makes Winter's CD-ROMs stand out is the way his mind and the technology synchronize. Winter isn't out to dazzle or show off the technology. (Elegantly designed in black and white, the programs score notably low on the whiz-bang scale; they aren't out just to make you exclaim, "Cool!") He uses the technology to convey a new vision of music.

He does so with a teacher's knowledge of what you need to know and when you need to know it, and a performer's knack for dramatizing his points. (When's the last time you met a scholar who cites as influences the Marx Brothers, Truffaut, and Spielberg?) You don't set his CD-ROMs aside when you've exhausted the gimmicks; you keep coming back to them. There always seems to be more intellectual matter — more substance — to uncover.

Winter wants you to see music from a variety of angles — political, social, and historical as well as purely musical. For him, classical music isn't a matter for lofty connoisseurship; it's a springboard for exploration and for making connections. "I want to start a discussion," is what he says when asked what drives him — then later: "I want to transform people."

Command central for Winter's campaign is his production studio — the 400-square-foot garage of the small Santa Monica house he shares with his wife, Julia Winter, their daughter, Kelly, and Cairn terrier, Teddy. The studio is crammed with books, CDs, monitors, three different music keyboards, Mac equipment, and a CD-ROM mastering machine. "Of course they're scared," he says gleefully of print publishing houses and movie studios. "In multimedia, there's

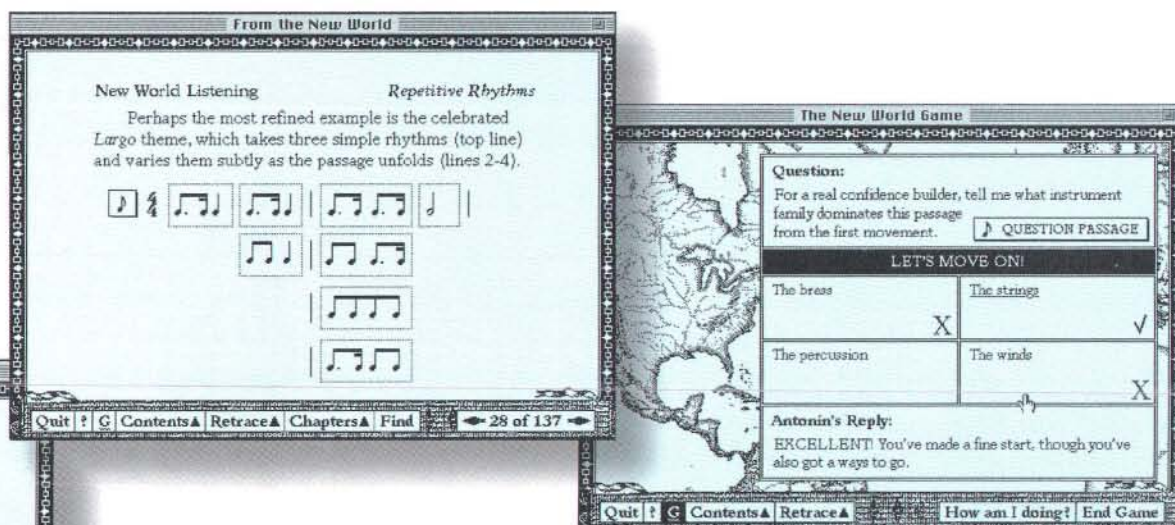
nothing Paramount or Random House can do with their millions that I can't do with my US\$50,000 worth of equipment." When people call to ask about how to get started in multimedia, he advises: "Guerrilla teams and no overhead."

This afternoon, he's putting finishing touches on the Dvořák piece and thinking about future projects. After the ragtime disc, he wants to do a general musical reference, a disc on Gershwin's *Rhapsody in Blue*, and beyond that, *The Birth of Rock 'n' Roll* that will begin with Robert Johnson and work up to 1954. He envisions 16 songs, dozens of other examples, interviews, printed primary sources, video clips. "The thing I can do that people who write about rock generally can't is talk about the music. When you hear Chuck Berry do 'Maybellene,' there is a certain kind of rhythmic impulse in the way in which the subdominant functions and the melodic apex is reached. That may sound very technical, but it's not. It's rooted in performance."

Winter is exhilarated by digital technology. In the new medium, he finds, he doesn't have to fight the tedious old cultural-literacy battles. They're irrelevant, and the results are implicit in the technology, so he's free to go on and realize his own ideas. Winter calls the computer "the ultimate postmodern machine — intrinsically playful and unstable." Even so, he's less of a Utopian than many of the digital futurists and propagandists: "The good guys may not win. I saw what the so-called 'promise of FM' turned into — and look at FM radio today. All I'm saying is that in the digital world, talent and brains may have a slightly better chance of rising to the top."

The son of Florida Republicans — "but really, really lovely people" — Winter grew up with no particular interest in music, and gave no evidence of special musical talents beyond a good ear. He lettered in three sports in high school and briefly considered a career as a professional baseball player before going to Brown University to study science.

"My father was an engineer, and it never occurred to me that boys did anything other than follow in their fathers' footsteps." He strug-



The programs score notably low on the whiz-bang scale;

they aren't out just to make you exclaim, "Cool!"

He uses the technology to convey a new vision of music.

gled joylessly his first year, earning Cs. Then, at a mixer one night, a classmate played part of a Mozart concerto. Within the week he switched majors to music; a year later, he says, he was playing a concerto himself in front of the school orchestra. Eventually he earned a master's of Fine Arts in piano and a doctorate in the history and theory of music.

His next epiphany occurred more recently, in front of a computer screen. Bob Stein of Voyager had met Winter years before in one of Winter's courses and told him he was a natural multimedia personality. "I had no idea what he meant," recalls Winter. In 1989, Stein showed up at Winter's house with a CD-ROM drive, hooked it up to a Macintosh, and demonstrated how the rig could provide onscreen buttons that could take him in less than a second to the exact micro-instant on a CD where he wanted to be.

"I knew then and there that this was my medium," Winter recalls. Within a couple of months, he and Stein had roughed out a sketch of his Beethoven's *Ninth* disc for Voyager and designed the interface. At the high-powered TED conference in 1990, Winter gave a demo of the program before an audience that included Microsoft's Bill Gates. The crowd reacted ecstatically. "We've finally seen what CD-ROM was made for," said Gates, who has since licensed the Winter programs to produce PC versions.

The Dvořák program is Winter's richest yet. He takes you into the music's structure, including a measure-by-measure analysis of the complete score. And he leads you out into the larger world of the era, using the music to "provide a window on cultural history." Like his other programs, the Dvořák disc is part engaging (if rudimentary) videogame, part major work of scholarship. You click around among historical chapters, a breakdown of the piece's structure, a glossary that's really a collection of short essays about music, dozens of demonstrations and examples, and more than 800 pages of original documents – press accounts, reviews, letters. Sitting at your computer, your head buzzing with information, ideas, and music, you feel you're in a room with records, books, scores, and an exciting teacher – all

right there with you – and every bit of it is available to you at the click of a mouse.

The complex Dvořák is an ideal subject for Winter's multiple-perspectives treatment. Dvořák was a larger-than-life, beer-guzzling fount of creativity who shocked proper New York during his 1890s visit by asserting that America's greatest musical resources were its African and Native American traditions. It says something about this moment in cultural history that the most valuable work available on a figure as protean as Dvořák should be not a book but rather a computer program.

The press has received Winter's discs enthusiastically. The *Los Angeles Herald Examiner* wrote, "It takes us directly up to Beethoven's worktable, and lays bare the whole creative process." *The New York Times* says, "A master teacher is the guide... an ideal musical companion." *MacUser* included all three of Winter's discs then available on its 1993 list of the top 50 CD-ROMs.

Winter calculates that he and the team at Voyager, including then-editor-in-chief Jane Wheeler and programmer Steve Riggins, along with independent designer/programmer Peter Bogdanoff, put 2,500 hours into creating the Dvořák disc. They included an impressive amount of scholarly sleuthing. One standard academic source that Winter consulted stated that a famous Dvořák protégé, Harry T. Burleigh – the black musician who brought gospel into the concert hall – had never been recorded. This claim intrigued Winter, who knew that Burleigh hadn't died until 1948. Following up on some rumors, he finally located a recording in the possession of a music collector in Connecticut. "How did you ever find me?" the man asked. Winter included the complete recording on the disc.

If Winter's an immaculately pedigreed academic, he's also a rene-gade intellectual in the tradition of Norman O. Brown, Glenn Gould, Paul Goodman, and Pauline Kael – original yet accessible thinkers with a taste for intellectual roughhousing. The only other comparable figure working today may be Camille Paglia, but unlike Paglia, with her kamikaze dives for traditional media celebrity, Winter uses

Tank Girl Stomps



Hollywood

Except for the fact that she's romantically involved with a mutant kangaroo named Booga, Tank Girl is your typical machine-gun-toting Aussie teenage punk. After a six-year stint in the UK-published *Deadline Magazine*, the comic-book cult heroine is coming to Tinseltown, complete with her own e-mail address.

Deadline publisher Tommy Astor knew it was only a matter of time before Tank Girl, created by artist Jamie Hewlett and writer Alan Martin, would hit the silver screen. "The boys love her, the girls love her. In London, there are even weekly lesbian gatherings called 'Tank Girl nights,'" Astor said.

Tank Girl movie director, Rachel Talalay, who produced the John Waters films *Hair Spray* and *Cry Baby*, is an online freak who's compulsive about checking her e-mail, the stock market, and baseball scores. She set up an e-mail address just for Tank Girl (*TankGirl1@aol.com*) to find out what comic-book fans are saying about everyone's favorite "second-hand punk/whore/moneyspinner roaming the outback in search of Spunk beer, horny kangaroos, and shitheads to shoot at" as a movie star, to be played by Lori Petty. (Emily Lloyd, from *A River Runs Through It*, originally

agreed to the part, but backed out when she found out she had to shave her head for the role.) The most frequent online comments are centered on the fear of Tank Girl's "Hollywood-ization." Rachel also found a special AOL keypal from Tennessee, who calls himself Tank Boy. He sent her a photo of his Tank Girl tattoo.

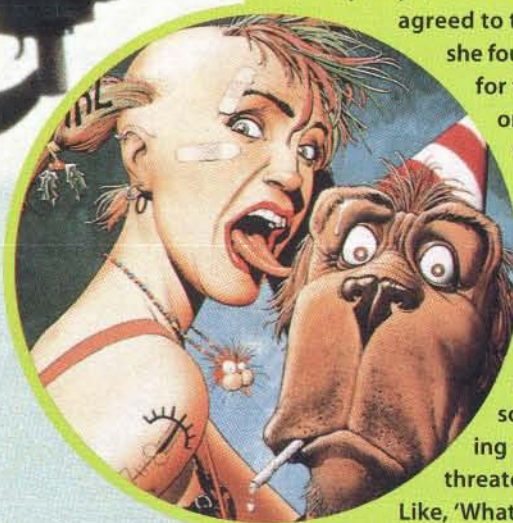
Talay admits that Tank Girl confuses the daylights out of some of the movie suits she's working with. "Sometimes the guys are threatened by it – the older agents.

Like, 'What is this? Why are the only good guys in the script mutant kangaroos?' 'Yeah,' I go, 'isn't that cool?'"

Mutant marsupials may be cool, but kangaroo bestiality is still a Hollywood no-no. "I think we've tried to push the envelope as much as we can," says Talalay. "Tank Girl still has a relationship with Booga; we're trying to keep that in there. That doesn't mean we plan on hard-core kangaroo sex." Rachel laughs, adding, "Kangaroos have double penis heads." She laughs a lot – a good sign.

Look for this interspecies-relationship movie from Trilogy to come hopping across a screen near you in March 1995. – John K. Bates

John K. Bates (johnbates1@aol.com) is a former Eagle Scout from Los Angeles. His last trip through southeast Asia lasted about a year and involved surfboards.



E-MONEY



The killer application for electronic networks isn't video-on-demand.

It's going to hit you where it really matters – in your wallet.

Digital cash, e-money, bit bucks ... whatever you call it, not only will it revolutionize the Net, it will change the global economy.

Clouds gather over Amsterdam as I ride into the city center after a day at the headquarters of DigiCash, a company whose mission is to change the world through the introduction of anonymous digital money technology. I have been inundated with talk of smart cards and automated toll takers and tamper-proof observer chips and virtual coinage for anonymous network ftps. I have made photocopies using a digital wallet and would have bought a soda from a DigiCash vending machine, but it was out of order.

My fellow passenger and tour guide is David Chaum, the bearded and ponytailed founder of DigiCash, and the inventor of cryptographic protocols that could catapult our currency system into the 21st century. They

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may, in the process, shatter the Orwellian predictions of a Big Brother dystopia, replacing them with a world in which the ease of electronic transactions is combined with the elegant anonymity of paying in cash.

He points out the plaza where the Nazis rounded up the Jews for deportation to concentration camps.

This is not idle conversation, but a topic rooted in the Chaum *Weltanschauung* – state repression extended to the maximum. David Chaum has devoted his life, or at least his life's work, to creating cryptographic technology that liberates individuals from the spooky shadows of those who gather digital profiles. In the process, he has become the central figure in the evolution of electronic money, advocating a form of it that fits neatly into a privacy paradigm, whereby the details of people's lives are shielded from the prying eyes of the

state, the corporation, and various unsavory elements.

Fifteen years ago, David Chaum seemed a Don Quixote in Birkenstocks, a stray computer scientist talking of a technology that appeared more rooted in science fiction than high finance. Today, still bearded, but wearing a well-tailored suit, he stands in the thick of a movement that seems unstoppable – the digitization of money. His passion now is to explain that the change need not be oppressive. He travels among bankers and financiers, he runs a company, he proselytizes. And he hopes somebody listens, because the wild card in the era of digital money is anonymity, and David Chaum thinks we're in trouble without it.

Dollar Bills or Bill Dollars

The next great leap of the digital age is, quite literally, going to hit you in the wallet. Those dollar

(THAT'S WHAT I WANT)

By Steven Levy



bills you fold up and stash away are headed, with inexorable certainty, toward cryptographically sealed digital streams, stored on a microchip-loaded "smart card" (a plastic card with a microchip), a palm-sized "electronic wallet" (a calculator-sized reader and loader for those cards), or the hard disk of your computer, wired for buying sprees at the virtual mall.

Of course, real money – the trillions of dollars handled each day by banks, other financial institutions, and government clearinghouses – is already digital. No physical tokens are exchanged: all transactions are conducted using streams of bits. But digitizing the final mile of electronic money, where the coin and dollar bill go the way of the vinyl LP, will make all the difference in the world. It will not only change the physical way you spend your money, it will alter the way you view your own economic being. And depending on the manner in which it is imple-

mented, digital money might allow others to view your financial status with a decidedly discomfiting intimacy.

Is e-money really going to happen? Inevitably. Hard currency has been a useful item for a few millennia or so, but now it has simply worn out its welcome. A recent paper by several cryptographers at the Department of Energy's Sandia National Labs in Albuquerque, New Mexico, begins by enumerating what all e-money advocates identify as the fatal flaws of cold hard cash: "The advent of high-quality color copiers threatens the security of paper money. The demands of guarding it make paper money expensive. The hassles of handling it (such as vending machines) make paper money undesirable. The use of credit cards and ATM cards is becoming increasingly popular, but those systems lack adequate privacy or security against fraud, resulting in

a demand for efficient electronic money systems to prevent fraud and also to protect user privacy."

"Cash is a nightmare," says Donald Gleason, president of the Smart Card Enterprise unit of Electronic Payment Services Inc. "It costs money handlers in the US alone approximately US\$60 billion a year to move the stuff, a line item ripe for drastic pruning. The solution is to cram our currency in burn bags and strike some matches. This won't happen all at once, and paper money will probably never go away (hey, they couldn't even get rid of the penny), but bills and coinage will increasingly be replaced by some sort of electronic equivalent."

The coming of e-money would seem to demand that the governments of the world get together and implement a scheme to make the shift in an orderly fashion. But that's not happening. The US, in particular, is promulgating public cluelessness. When I called a

spokesperson for the Federal Reserve to ask about electronic cash, he laughed at me. It was as if I were inquiring about exchange rates with UFOs. I insisted he look into it, and he finally called me several days later with the official word: the Federal Reserve is doing nothing in that area.

Outside the Fed, there are people in government interested in the issue – isolated visionaries in the Department of the Treasury and Congress, in the Office of Technology Assessment – but while they ponder it, plenty of other institutions are devising schemes that will knock our currency preconceptions for a loop. The timetables are short, and as the players look around and see what their potential competitors are doing, those timetables get even shorter, particularly in the race to be first to deliver a plan that offers transactions on computer nets.

For starters, there is CyberCash Inc., sort of an all-star team of

pre-digital cash technologies. Headed by Bill Melton, the creator of the Verifone system that handles credit-card transactions between merchants and banks, the principals include Jim Bidzos, president of the cryptography provider, RSA Data Security Inc., Steve Crocker, vice president of Trusted Information Systems Inc. (another prominent crypto-firm), and Dan Lynch is chair and founder of Interop Co. (which produces the largest Internet trade show worldwide). "We will provide cyberspace with financial communications that will be safe and secure and convenient," says Bruce Wilson, CyberCash's chief operating officer. In the first quarter of 1995, CyberCash will offer a network equivalent of debit-card transactions, then expand to credit cards. The next step: cash-like components that support peer-to-peer payments.

Visa has gathered a consortium of financial institutions to design "Electronic Purse," specifications for low-cost purchases at gas stations, convenience stores, grocery stores, fast-food restaurants, and school cafeterias, in addition to such routine items like calls from pay phones, road and bridge tolls, and videogames.

Citibank has been running a prepaid card test in a Long Island facility. There is the aforementioned Smart Card Enterprise of the Electronic Payment Services company, which wants to piggyback spending money on its network of ATMs.

There is the NetCheque project, a debit-card system, developed by the Information Sciences Institute at the University of Southern California. And there is the Information Networking Institute, part of Carnegie Mellon University, whose NetBill is also based on the debit-card model.

Many transit companies envision fare tickets as coinage to buy newspapers and sundries. The phone companies issue phone cards with similar pretensions.

In Denmark, Danmont has distributed over 100,000 cards with money for spending on such things as parking meters and laundromats. Similar systems exist in Portugal and Singapore.

Mondex, a consortium led by two British banks, will roll out its digital-cash system, involving an estimated 40,000 cardholders, to the public in Swindon, England, next year. Its creators envision the system spreading worldwide, as people slip their smart cards into special phones and wallets to conduct cash-like, tamper-proof transactions, even across borders. "It will become ubiquitous - it's the cheapest way of moving money around," says Dave Birch, spokesperson for the project's consultants, Hyperion. "

There's the state of Ohio which has in the works a smart-card system for replacing welfare checks with electric money. At Mankato State University in Mankato, Minnesota, students are issued "MavCards," to be used not just for MCI long-distance calls and dining-hall meals but for cash services like photocopying, vending, and laundry.

Finally and inevitably there's Microsoft. For months, it had been quietly organizing a digital money group, presumably to put its own stamp on the emerging phenomena of digital transactions. But things went into overdrive in October, when it laid out \$1.5 billion worth of stock to snatch up Intuit, Inc. a financial software company which was determinately moving towards automating money. Along with the buyout, Scott Cook, Intuit's president, became Microsoft's executive vice president of electronic commerce - reporting directly to chairman Gates, begging the question, will dollar bills be replaced by Bill dollars?

As a result of this mad rush, the road to digital cash is not so much a smooth transitional path but a multi-lane cloverleaf with infuriating turnoffs, circles, and dead

ends. "A lot of people assume there's going to be a single form of digital money," says Microsoft's chief technical wizard, Nathan Myhrvold. "Today we have a zillion different ways of doing financial transactions. There's cash, checks, credit cards, debit cards, wiring money, traveler's checks ... each of these has a particular point. We're going to see that much diversity in digital money."

Kawika Daguio, a Washington, DC, representative for the American Bankers Association, is familiar with the issue and says, "We may be in a situation analogous to the 1860s - in those days, before our current Federal Reserve system, bank checks backed by different institutions weren't as widely accepted - they circulated and were usually discounted. Chartered banks also printed private-bank notes. Now, we see that some institutions are interested in printing their own versions of electronic money and following their own rules."

Sholom Rosen, a vice president at Citibank, puts it more succinctly: "There are going to be winners and losers, but everybody is going to play." Michael Nash, Visa's senior vice president in charge of the cash-products division, recalls the excitement among executives last June when they witnessed a test of the credit-card consortium's smart-card experiment at a retreat in Cancun, Mexico: "We had senior banking executives lining 70-deep to try this out!"

Considering all these schemes in the aggregate, it is possible to envision the way money will work in the future. But we must distinguish between forms of electronic commerce - including credit cards and bill paying - and electronic cash, in which money is in a fungible, universally accepted, securely backed format and can be passed, peer to peer, through many parties while retaining its value. You know, *money*.

First of all, imagine that all the

uses of credit cards and debit cards are seamlessly integrated into electronic format. Now start to think about real money. Cash will reside in credit-card-sized plastic smart cards which can be stored in palm-sized "electronic wallets." The days of nervously accessing the ATM machine at 2 a.m., looking over your shoulder for muggers, are over. You'll download money from the safety of your electronic cottage. You will use these cards in telephones (including those in the home), as well as electronic wallets, disgorging them whenever you spend money, checking the cards on the spot to confirm that the merchant took only the amount you planned to spend. The sum will be automatically debited from your stash into the merchant's. Cash will be a number, a digitized certificate you'll probably never see.

Commerce on the Net will reproduce the process in cyberspace: you will download money from your bank, put it in a virtual wallet, and spend it online. You will also be able to receive money from your employer, someone who buys something from you, or a friendly soul who lends you a virtual sawbuck until payday.

Exactly what goes on inside smart cards, wallets, and computers won't be apparent. But the protocols chosen by the lords of e-money are all-important. Depending on how they work, the various systems of electronic money will prove to be boons or disasters, bastions of individual privacy or violators of individual freedom. At the worst, a faulty or crackable system of electronic money could lead to an economic Chernobyl. Imagine the dark side: cryptocash hackers who figure out how to spoof an e-money system. A desktop mint! The resulting flood of bad digits would make the hyperinflationary Weimar Republic - where people carted wheelbarrows full of marks

to pay for groceries – look like a stable monetary system.

A privately circulated paper written by Kawika Daguio sketches out some of the problems in the form of questions:

Who is going to create the monetary value?

In other words, who will back up the money, assuring trust. Will it be government? Banks? Visa? The New York City Transit Authority?

"A dollar bill is a piece of paper – what's the difference between that and another piece of paper?" asks Sholom Rosen of Citibank. "It is the ability to present that piece of paper and get assurance of a return. It's not backed. There was a time when it was backed, but those times are gone. What gives it value? The banking system. The paper is the liability of the banking system. The supply of money is grown and disappears in the banking system."

Yet others seem to think that, if universally trusted, a digital currency system can, in effect, float on its own momentum. "If you have money on the network, you can make private money on the network," says Eric Hughes, a co-founder of the privacy champions, the Cypherpunks. He is now exploring the possibility of setting up a cyberspace bank. "It's easiest not to turn the money into paper if you don't have to."

What security features will be included?

How will these systems protect against fraud? Can they be hacked or counterfeited? What will be the trade-offs between ease-of-use and security?

"People get sticky fingers," says Rosen. "The most honest guy in the world will find some cash and stick it in his pocket. When outsiders hear about digital-cash schemes, the first thing they say is, 'I'm going to break in.'"

Of course, smart cards have to

be tamper-proof so people can't reverse engineer them and double-spend. The prime protection is cryptography. "The bits in a container have to move from one to the other," explains Rosen. "When you're done, you have to have less in one container and more in the other. Also, your transaction can't be intercepted. Crypto can secure the transition. How strong the crypto is depends on who's going to try to break in – if it's the Mafia or a national government, they'll have plenty of resources."

David Chaum thinks, for instance, that some canny dark-side entrepreneurs can crack the Mondex system now being tested in England. Though its mathematical protocols are strong, he says, too much depends on the tamper-proofing of the cards. "One device can say, 'OK, I'm transferring \$100,000 to you,' and the other one says, 'Oh, fine, I believe you.' So if you break either one of those open (defeating the tamper-proof technology) and tell it you've got a zillion dollars, the whole system just dies." (Mondex insists its scheme cannot be cracked, but will not provide further details. "Suffice it to say we're betting the shop on it," says Dave Birch.)

Will they work so the value will be restored if they're lost?

Everybody seems to agree that smart cards holding digital cash should provide an option to punch in a Personal Identification Number before buying something; but there is also a consensus that most people won't use that option. "The consumer won't bother with that," says Visa's Michael Nash. "The key here is that we imagine this as expanding what you do with credit cards. We do not think the electronic purse is appropriate for people buying jewelry or automobiles." In many systems – Mondex is a good example – losing your stored-value smart card is like

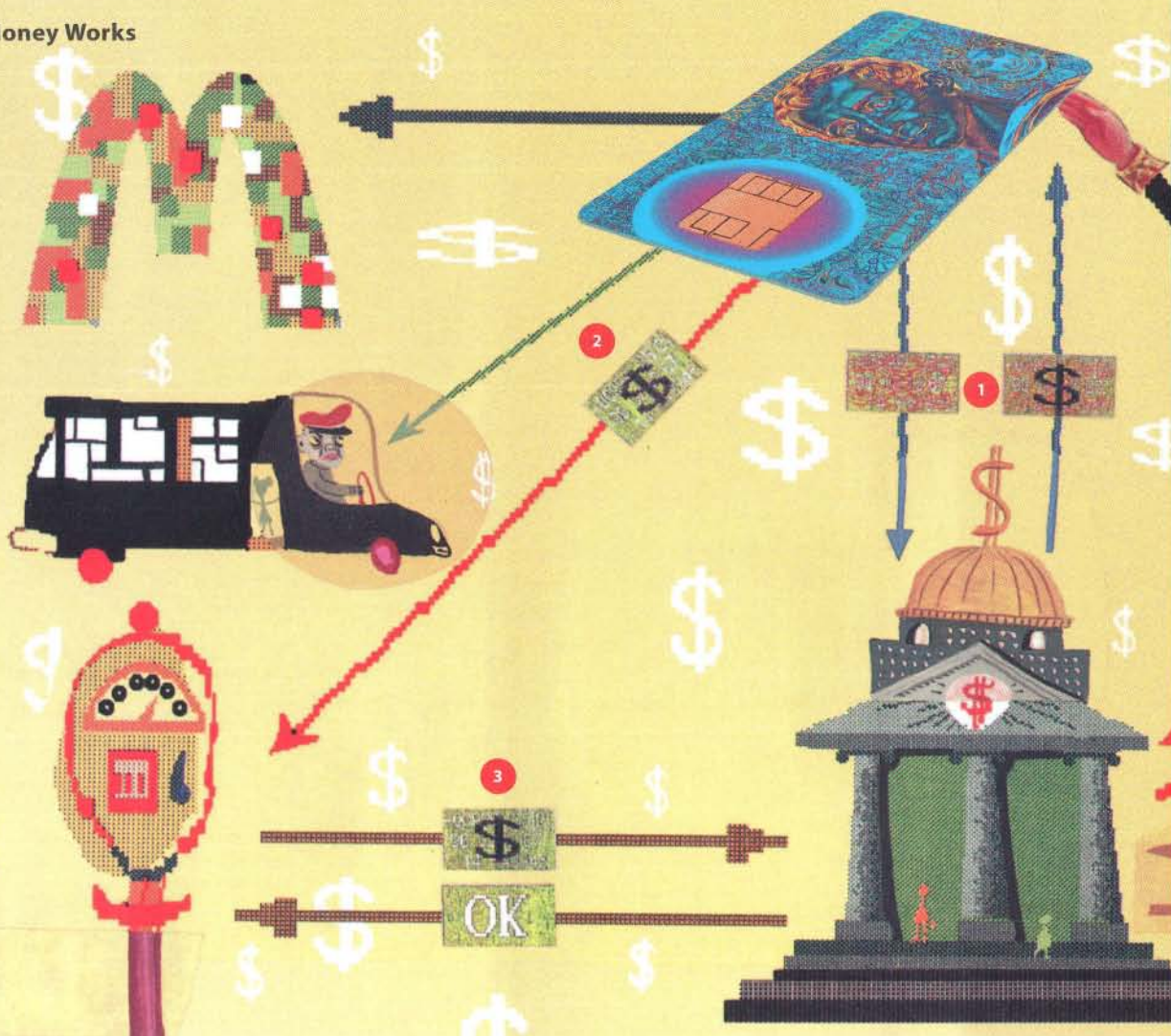


Hard cash is anonymous – you can spend your printed bills with the assurance that no one can compile a dossier on your lifetime spending records. But electronic cash has no such assurances. Its computer-mediated nature makes traceability the course of least resistance.

How Anonymous Electronic Money Works

Smart cards

- 1 Alice wants to fill her empty smart card with untraceable e-money taken from her bank. She inserts her card into an ATM-like slot in a machine at home or on the street. The gold computer chip on the card sends a random key to the bank in a digital "envelope." The bank signs the envelope with its signature, ensuring that the "money" inside can be trusted. Think of the envelope as having carbon-paper innards. The signature outside will transfer to the note inside without the bank knowing the destination of the money. The bank then sends the envelope back to Alice's smart card, which strips away the envelope, leaving a complex numerical code. Alice now has anonymous cash.
- 2 Alice can venture into the world and spend her e-money anyway she wants – as bus fare, at a mall store, in parking meters, or even to lend money to a friend, slipping the card into her friend's "digital wallet."
- 3 The recipient of anonymous e-money copies the math-money from Alice's smart-card chip and then has its computer add its own account ID number to it. This aggregate number (the money) is sent to the bank. (For added security, the bank might send an acknowledgment back to the recipient, but it's not essential.) The bank then credits the recipient – bus company, store, city, or friend – with the specific amount of money. However the bank cannot trace the money to Alice.



losing a wad of bills. Don't carry more than you can afford to lose.

Who's going to regulate electronic money?

At the moment, all the players are proceeding as if no one is. They extrapolate a regulatory system growing out of the current one, while they are aware that as the digital economy becomes pervasive there may be calls for new limits and regulation. As for now, the rush is to get everything in place, and no traffic cops seem to be slowing anybody down.

Who's going to pay for it?

"I don't believe that it's sound policy to charge somebody royalties for engaging in the virtual

world's equivalent of putting your hand in your pocket, pulling out a bill, and handing it to somebody," says Kawika Daguio. He is particularly perturbed by the claims of Online Resources & Communications Corporation, a company in Virginia that insists that it holds a patent (US # 5,220,501) giving it "exclusive rights to process real-time electronic transactions of consumers who use any in-home terminal to purchase goods and services, pay bills, and bank through a debit network, including the automated teller machine networks." Online Resources further claims that "the patent covers all in-home terminals, including telephones, computers." (The patent may be challenged by banks and ATM processors.)

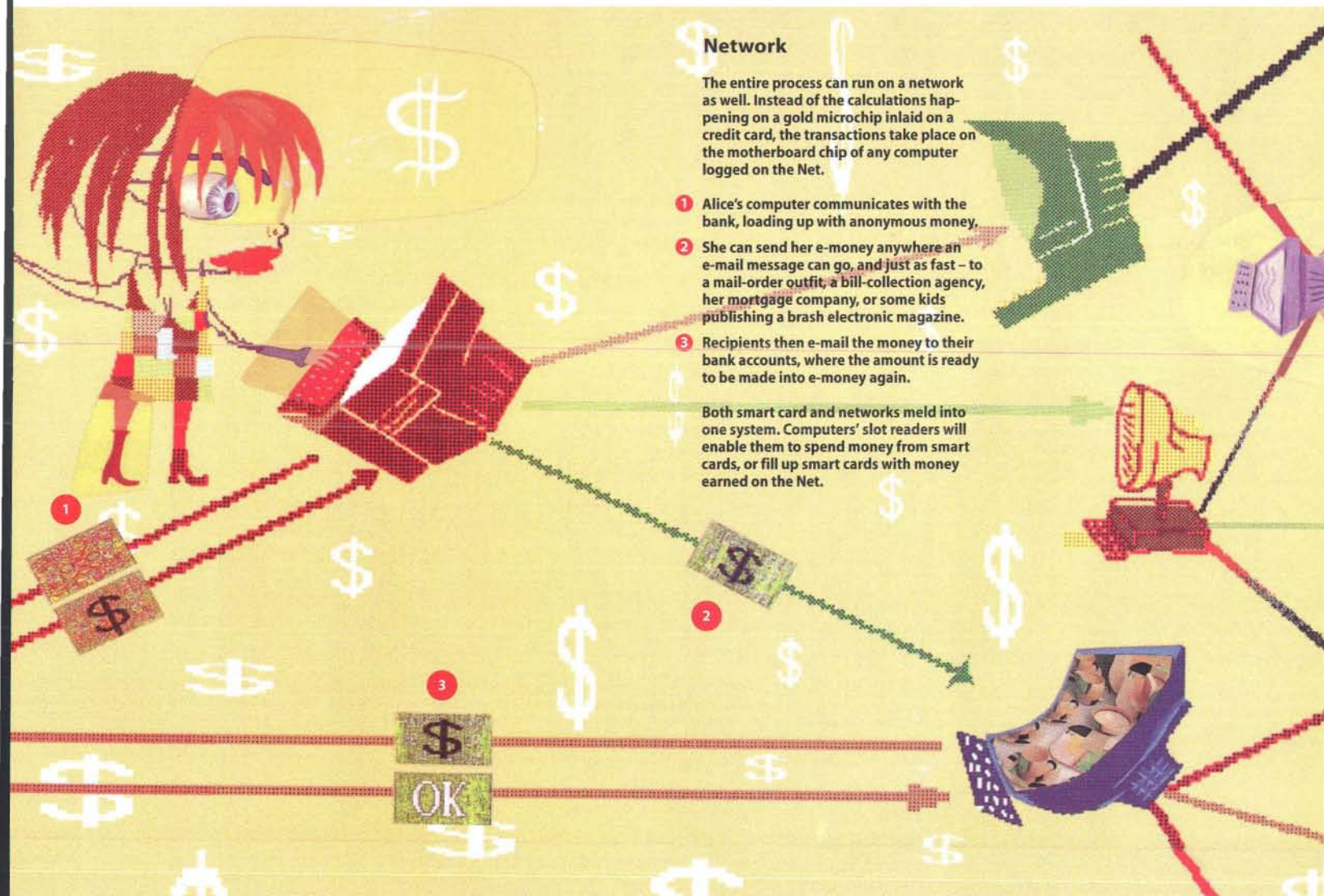
On the other hand, Microsoft's Myhrvold, perhaps anticipating a licensing revenue that would make DOS look like a drop in the bucket, challenges Daguio's assertion, claiming that we already pay the equivalent of such a fee. "Of course you do," he says. "Explicitly or implicitly there's a fee involved. Even in a pure-cash transaction, you pay for those costs. Cash is an expensive thing to move around. You have to hire guards from Brinks with guns and all that bullshit. That's all included in the price of things you buy."

The bottom line is that nothing is free, especially when it comes to money. You will pay for e-money, either in transaction fees or, as in the CyberCash model, by allowing others to earn interest on your

electronic cash – even as it sits in your virtual wallet.

In short, the various systems have implicitly or explicitly postulated tentative answers to some of these questions, and the answers to others, such as the regulatory structure, will have to evolve as the idea catches on. But one question remains open: the dichotomy between privacy and traceability.

Hard cash, of course, is anonymous – you can spend your printed bills with the assurance that no one can trace your expenditures or compile a dossier on your lifetime spending records. But electronic cash has no such assurances. Its computer-mediated nature makes traceability the course of least resistance. This gives rise to a provocative ques-



tion: Can digital cash become anonymous, as real-world money is? And if so, should it be?

And these questions lead us back to Amsterdam - headquarters of DigiCash, the company formed by David Chaum.

Digital Money Man

In the world of digital cash, David Chaum is the marked penny that keeps reappearing. His ideas circulate as freely as cash itself. He is indisputably the pioneer of the field, the one who shifted it from the ether of science fiction to the solid footing of mathematical truth. But the man himself is the center of controversy. All of those involved in the daring attempt to shred dollar bills into arcane mathematical formulae know of

Chaum, and almost all admire his work. But when they talk of their dealings with him, they immediately go off the record. It turns out that at one point they considered licensing Chaum's patents or at least recruiting Chaum's participation in their projects. These processes seemed to end in fruitless standoffs, sometimes acrimonious ones. Then, inevitably, more negotiations. Chaum cannot be ignored even by those who disparage him off the record.

Why are all these people so worked up about David Chaum?

I get a hint the day after my ride with Chaum through Amsterdam. We have made plans to meet at a coffeehouse off the Keizersgracht.

Our plan is to spend the entire day talking about digital money and his work. But before the tape

recorder goes on, Chaum takes pains to make one thing clear to me: he is not, as some people derisively call him, some sort of privacy nut. He is by no means a paranoiac, but merely someone who has made some remarkable discoveries that people should know about before they make irrevocable choices about the traceability of their finances.


Fine, I say, and begin the interview. Tape recorder on. "How old are you?" I ask. "I don't tell that to people," he says.

At heart, David Chaum is driven by ideals. Indisputably the brains behind making digital cash work, he holds the key patents in the field, particularly in the area of anonymous, untraceable cash. He is therefore in a position to become a very rich and powerful

person. Yet he avoids the path of least resistance and largest revenues - cashing in by licensing his schemes - because he is passionate about the potential of anonymous cash and wants the news of its viability spread far and wide.

He says that if, after knowing that the possibility of private, digital-monetary transactions exists, people opt to spend their money with the same traceability as credit cards, he will accept the decision. But he doesn't think that will happen. His guess is that once people are aware of the issues, they will agree that traceable routes are the evil of all money.

From a very early age, David Chaum had an interest in the hardware of privacy. "What's important to realize is that there is a strong driving ▶ 213

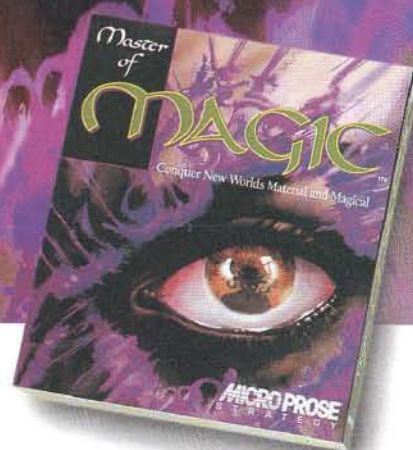


Meet Rjak.
He wants to rule the World.
Only you can stop him. Introducing
MASTER OF MAGIC
the first PC game to combine strategic
conquest and fantasy adventure in
one unique realm.
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are yours to command.
That is, unless Rjak and his friends
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CD Rights

Amnesty Interactive, developed as a public service by volunteer artists and technicians, takes on the challenge of bringing into the schools one of the most important issues facing humankind. This high-minded CD-ROM attempts to dig its way to the heart of the UN's Universal Declaration of Human Rights and the consistent heroics of Amnesty International. For fleeting seconds, it gets there.

To do so, it uses all the tools known to CD-ROM. That is: full-color photos of Chinese school kids and Thai rice farmers, dissolving to the sounds of distant drums and jarring gunfire; tiny clips of



Human rights on ROM.

clever animation; video interviews; and more. Meanings grow to their fullest when the disc's little narratives have time to take shape. Bios of prisoners of conscience as well as statistics (Gambia, life expectancy - 47 years), for the most part, hit home.

Like any teaching tool, *Amnesty Interactive* will have to be accompanied by some smart pedagogy (not to mention expensive hardware to run it). Nevertheless, educators ought to tap its rich visuals, its great soundtrack, and its tales of "the human family" and "barbarous acts." - *Martha Baer*

Amnesty Interactive: US\$10.
The Voyager Company: (800) 446 2001, +1 (212) 431 5199.

Sega's Tokyo Joypolis

Trust the Japanese to turn bumper cars into a team sport. At Sega's new Joypolis, a vast indoor amusement arcade at Shin Yamashita, Yokohama, near Tokyo, the bumper cars don't just ram one another. As members of the Red and Green teams, they suck up rubber balls from the floor and fire them through a cannon at the cars of the other team. In the game I played, I was a Green team member. Red won, with 2,510 points, according to the computer printout I received after the game. (Green's point score was not provided, perhaps to save face.)

Joypolis, scheduled for cloning in Los Angeles in the near future, is located in a new building not far from a giant Ferris wheel inspired by *The Third Man*. Its star attraction is "VR-1," a virtual reality ride in which players are strapped into seats on large moving platforms, like Space Wars at Disney World. Participants wear computerized, head-mounted display units that are motion sensitive, allowing a 360-degree view as players turn their heads. They can watch a battle going on all around them, and participate with weapons controlled from their seats. The ride certainly creates the illusion of movement, but the view from inside the helmet is fairly



Sega's Joypolis: You get a printout to keep as a reminder of the fun you had.

crude; the images are low resolution, and the refresh rate lags.

Some attractions are souped-up versions of existing technologies. The Astronomicon, for example, is a computer-generated astrological chart, hooked up to lots of bells and whistles. After programming your personal Pyramid Cube with your birth date, you can watch a video while your chart is printed out.

Other attractions include Rail Chase the Ride, with cars moving on a track past multimedia images; Ghost Hunters, in which players shoot at ghost images projected in front of their moving vehicles; AS-1, a ride similar to Douglas Trumbull's Showscan rides in Las Vegas, where cars on a moving platform are synchronized with images on a giant screen. There are also plenty of standard arcade games.

When Sega builds another Joypolis in Los Angeles, they might want to revise some of the English names for their attractions, including the official Joypolis symbol, the "Basic Universal Reflector Prism" - or, as the publicity handout explains, "B.U.R.P." - *Roger Ebert*

Joypolis, Yokohama, Japan. General admission: adults ¥500 (US\$5), children ¥300 (US\$3). +81 (3) 5736 7037.



Absolutely Fabulous

Take two burned-out female Brits living on lingering fumes from the '60s, toss them into the '90s, add a strait-laced teenage daughter more intent on studying than partying, and you've recreated *Absolutely Fabulous*, the British sitcom that has stormed Comedy Central.

Let's face it, one person can stand only so much British television fare, but *Absolutely Fabulous* is absolutely different. Where else do you get a show in which the main characters, Edina and Patsy – a fashion publicist and fashion editor, respectively – disguise their cocaine spending as invoices for wicker baskets,



Ab Fab rules OK!

wind up in a sex scandal with an MP, fall down drunk nearly every episode, and sell Edina's daughter, Saffron, into temporary white slavery in Morocco.

With only 12 episodes under its belt, and another 6 scheduled for production, *Absolutely Fabulous* is the closest thing to a successful UK comedy hit in the US since *East Enders* or *Monty Python*. If you have a free half-hour, there's absolutely no better way to blow it than following along as Patsy and Edina fumble their way through another day of modern life.

— Rich Santalesa

Absolutely Fabulous, on Comedy Central.

Pop Goes the Millennium

Millennium pop is a quarterly newsletter based on an interesting premise: as the info-glut thickens, and mass culture becomes more pervasive than ever, there's a distressing lack of animated, literate commentary about our so-called cultural dream life. "As the pop catalog explodes across 500 cable channels and the mushrooming Internet," says *mp* Editor Tim Riley (who's authored solid tomes on the music of The Beatles and Bob Dylan), "illuminating pop criticism is fading from the mainstream media."

I'm not so sure I agree – quality aside, it seems that serious critics are addressing themselves more to Madonna than to atonal music these days – but that's no reason to pass over *millennium pop*. Its first issue (summer 1994) provides 24 pages of witty, sometimes delightfully contrarian commentary on issues ranging from Eddie Murphy's flop-ridden film career to the discreet charm of Helen Mirren. Comics fans will learn about Dylan Dog, a pomo strip that's taken Italy by Fiat, and theater mavens will appre-



millennium pop: Witty, sometimes delightfully contrarian commentary on mass culture.

ciate a dyspeptic take on the recent Lincoln Center revival of *Carousel*.

Pop music, however, is front and center – I think Riley's real goal is to resuscitate the once gonzo-proud, now semi-brain-dead genre of rock criticism. The best things in *mp*'s first edition are Chuck Eddy's hilarious take on rock sellouts, and Milo Miles's brave puncturing of the hype balloon surrounding Johnny Cash's "roots" effort on American Recordings.

The contributors to *millennium pop* all seem to hold day jobs writing for places like the *Village Voice*, the *Boston Phoenix*, *The Washington Post*, and National Public Radio – but in these pieces one senses a liberation that comes from writing straight to insiders. It's the pop-criticism equivalent of a jazz club after the rubes go home, when the musicians play to satisfy only themselves. Somewhere in heaven Lester Bangs is smiling.

— Steven Levy

millennium pop: US\$24.95/4 issues. +1 (617) 661 4518, e-mail 71477.304@compuserve.com, 173 Morrison Ave., Somerville, MA 02144.

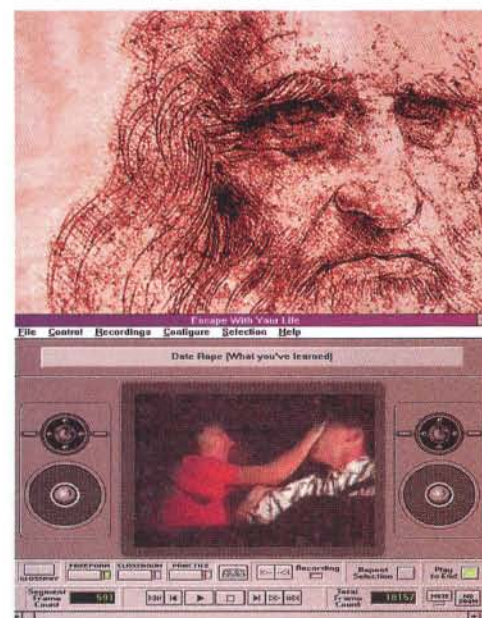
CD-ROMs That Suck

CD-Romix: Prime #1

You have to wonder. A comic book like *Prime* costs about US\$1.50, is portable, disposable, and requires no special talents or equipment to read. Put it on CD-ROM, and you now have something that costs 20 times as much and can only be read when you're sitting in front of \$2,500 worth of hardware. Is there a compelling reason for directly translating a comic book into this new medium? With the exception of one vivid and thrilling sound effect of the hero vomiting, the answer is No, no, no.

Leonardo The Inventor

This is a beautiful program, with a keen visual style and well-chosen music. With some discipline and care, it could have been a first-rate piece of edutainment. Unfortunately, it serves as a vivid example of how not to do multimedia. Click on a button called Leonardo's Words, and you'll see what's wrong with



Leonardo: A vivid example of how not to do multimedia.

this program in a nutshell. A box will appear containing a dense quote from Leonardo da Vinci – a series of observations on the structural similarities of moving water and moving hair, for instance. This is great stuff, if hard to digest; remember, Leonardo was a genius. Unfortunately, there's no obvious way to keep the window open long enough to listen to the voice – sounding alarmingly similar to Father Guido Sarducci's – that recites the quote; before you've had a chance to figure out what Leonardo might have meant, the window snaps shut.

Escape With Your Life

This is a self-defense-for-women video that has, unaccountably, been transferred to CD-ROM. It has an amazing amount of footage of seedy guys menacing women, in episodes with titles like "The Date Rape" and "The Stairwell." The women, with their eye-pokes and throat-punches and wrist-twists, evade the bad guys over and over again. For the most part, using this program provides almost exactly

CD-ROMs That Suck Cont.

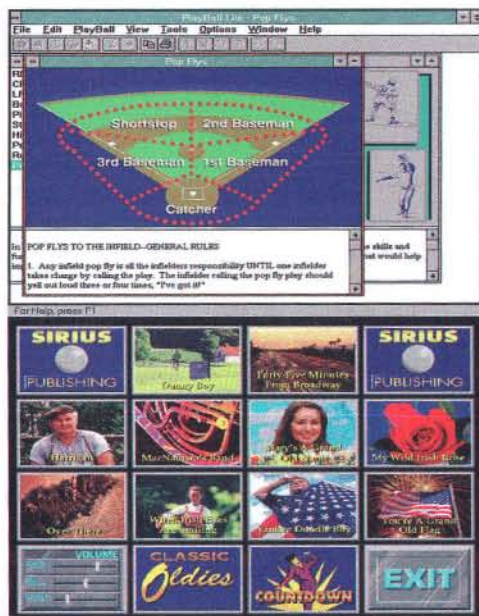
the same experience as viewing the videotape that comes with it. Why it's on CD-ROM is a mystery.

ESPN Sports Shorts

This is the perfect gift for ... well, for the people whose computer use is cutting into their TV watching. It includes slide shows of anonymous sports figures in unnamed competitions, brief video clips of guys stealing bases and sailboats coming about, sound clips from announcers who are terribly excited about something, and so on. It's like watching TV a half-second at a time. The utility programs give you tools to hook up selections from these de-contextualized media bites into your Windows environment: wallpaper, system sounds, that kind of thing. The result is not utterly useless, but it's close.

5 FT. 10-PAK, Volume I

I'm in love with this. If you're a connoisseur of CD-



ESPN Sport Shorts: Like watching TV a half-second at a time.

ROMs that suck, this is the deal for you: 10 unwanted, abandoned CD-ROMs repackaged in one convenient, 5-foot-long vinyl package. There's *PC Animation Festival*, which is full of stuff that might have seemed cool three years ago but is just tedious today. The nadir, though, is *PC Karaoke, Classic Oldies*. All I can say is that if I'm drunk enough to sit at my computer and sing "Danny Boy" and "Harrison," I'm drunk enough that I shouldn't be anywhere near my computer. —Robert Rossney

CD-Romix: Prime #1: US\$24.95. P.O. Box 2961, Torrance, CA 90509. *Leonardo The Inventor*: \$US49.95. Interactive Electronic Publishing Corp.: (800) 472 8777, +1 (914) 426 0400, fax +1 (914) 426 2606. *Escape With Your Life*: US\$ 49.95. Villa Crespo Software: +1 (708) 433 0500, fax +1 (708) 433 1485. *ESPN Sports Shorts*: US\$39.95. Moon Valley Software: (800) 473 5509, +1 (805) 781 3890. *5 FT. 10 PAK, Volume I*: US\$29.95. Sirius Publishing: (800) 247 0307, +1 (602) 951 3288, fax +1 (602) 951 3884.

Virtual Loneliness

This CD-ROM does a remarkably good job of simulating how it feels to be a lonely guy out cruising bars, dance clubs, and diners, getting rudely shot down by women who would rather dance alone than with you. Whether or not this is an experience to volunteer for is another question.

Though still a little raw, *Midnight Stranger* is the first use of an ambitious approach to interactive drama, which designers Simon Goodwin and Jeff Green call Virtual Intimacy. It has the flavor of close collaboration with a talented group of actors, and as such gives a sense of what theater people might do with the interactive medium. Most screens are full-screen stills of actor and background, with a rectangular digital-video window in the head and torso area that doesn't pretend to mesh more than loosely with the still.

The most interesting, and the most problematic, design technique is an original input device called The Mood Bar™. A character will say something to you directly, then pause. You can react negatively, neutrally, or positively, by clicking somewhere along a colored bar. If you want a conversation to continue, however, you have only one real choice. Consistently poke away at the "upbeat" green end of The Mood Bar™ and the charac-



Midnight Stranger: To win, you've got to play it like a shrink on happy pills.

ter will eventually invite you home (even the lesbian grad student, though in this title you are male). Hit anywhere but green, and the character will instantly get furious and throw you out. When a cute girl in a dance bar started cracking stupid jokes about how I must still live with my parents, I clicked in the neutral blue zone of my Mood Bar™. Instantly she got pissed, told me to "fuck off," and split. The next time I went to the bar, I "laughed" at her jokes and was soon rewarded with a POV shot rocking up and down above her naked torso. You've got to play it all as if you're a shrink on happy pills.

At its best, the writing neatly "samples" what would in reality be a lengthy conversation, creating a naturally flowing sense of high point and ellipsis. But the structure's potential has not been fully utilized. The story to which all this cleverness is applied ends up being about as meaningful as an evening spent cruising singles bars. The overall approach is interesting enough, though; the next title using it should be something to look forward to. —Jim Gasperini

Midnight Stranger, by Simon Goodwin and Jeff Green, for Mac or PC: US\$69.95. Gazelle Technologies Inc.: (800) 843 9497, +1 (619) 536 9999, e-mail service@educorp.com.

Keep Out

Keep Out, a 10-page, bimonthly newsletter published by cypherpunk and BBS sysop John Schofield, is dedicated to providing "complete, accurate, and up-to-date information [on] cryptography, civil liberties, electronic anonymity, digital cash, and everything else that could possibly affect your privacy."

The inaugural issue, published in August, features an interview with Philip Zimmermann and an introduction to the politics of PGP. There is even a brief update on Voice PGP, Zimmermann's as-yet-unreleased alternative to Clipperphones.

A beginner's guide to how PGP works is simple yet infor-



Decoding cypherbabble.

mative, and carries novices from the Caesar cipher all the way to RSA. The best part was an extensive review of several PGP-specific mail-reading utilities, which give encryption a usable interface.

Even if *Keep Out* remains a layperson's guide to PGP and basic encryption techniques, without reaching its overly ambitious goals, it's a good buy for those who want to do something about privacy and not be bothered with the nitty-gritty of algorithms and politics. —Rishab Aiyer Ghosh

Keep Out, The Journal of Electronic Privacy: US\$15/6 issues. +1 (818) 345 8640, fax/bbs +1 (818) 342 5127, e-mail keepout@f903.n102.z1.fidonet.org.



Audio Paradiso

Sound Practices: A Journal Of Audio Technology, which is hands-down the hippest and most controversial hi-fi 'zine, reverses the common belief that the hi-fi gear of the '30s, '40s, and '50s sucked and that modern components sound superior. This mag argues just the reverse: that ever since the gritty transistor replaced the smooth-sounding tube, the sound of hi-fi systems has steadily gotten worse instead of better.

While the public has been trained to think that modern plastic speakers and \$200 transistor receivers sound better than the old tube-and-horn stuff, audiophiles have been grabbing vintage

SOUND PRACTICES

A JOURNAL OF AUDIO TECHNOLOGY SPRING 1998 \$4.95 (US) \$5.95 (CAN/UK)



Audio Renaissance Issue Vol. 2: #1

Get tubed!

American gear for their own hardcore jollies – at prices hundreds of times what the stuff originally sold for.

Lest you think that a bunch of guys into '30s retro-tech are old freaks, the *Sound Practices* mob is made up of swashbuckling techno-anarchists who range from members of the avant-garde NY art scene to many of the most well-respected minds in international hi-fi. And the articles range from the highly technical to wildly imaginative think pieces.

If you're into music and pushing the envelope, *Sound Practices* is what you need to read. – Corey Greenberg

Sound Practices: US\$20/4 issues. *Sound Practices*: +1 (512) 339 6229, e-mail sp@tpoint.com.

Trip on Tape

Computer-animation videos are traditionally plagued by brain-dead music. Not so with *(Motion)*, the latest installment in Warp Records's Artificial Intelligence entertainment series.

Preceded by a string of groundbreaking CDs by artists such as Polygon Window (aka Aphex Twin) and Balil (aka Black Dog), *(Motion)* is the flagship Artificial Intelligence video.

New Agers are bound to feel threatened, and computer animation purists may nit-pick, but the rest of us will find a video that unites digital sights and sounds in a way that is absolutely sublime. Spliff-smoking cyborgs, mutating microscopic blobs, and search-and-destroy remote 'droids set the tone for this trip. Genre clichés are kept to a minimum – in fact, the only dolphins you'll see here are being attacked and consumed by some weird-ass environmental foe. The rest of the time, the viewer is



(Motion): Do spliff-smoking cyborgs dream of WD-40 milkshakes?

flowing through a seamless depiction of what director/ animator Phil Wolstenholme refers to as "an attempt to define the area of consciousness that is normally inaccessible to the waking brain ... [what] is often called 'The Other.' This is roughly equivalent to some serious astral projecting with a HandyCam on board.

Equal emphasis is placed on the *(Motion)* soundtrack. Material from Artificial Intelligence veterans Polygon Window, Speedy J, and Autechre are combined with tracks from newcomers Mark Franklin and Beaumont Hannant. Like all the best progressive electronic and ambient songs, these invoke visions of alien vistas and impossible technology. Conveniently, the makers of *(Motion)* have come up with some visuals that can rival the imaginings of even the most whacked-out of us. All you have to do is plug it in and open your head. – Scott Taves

(Motion): \$US15.98. In North America: Wax Trax! +1 (312) 252 1000, fax +1 (312) 252 1007. In the UK/Europe: Warp Records (England): +44 (74) 275 7586, fax +44 (74) 275 7589.

The Unix-Haters Handbook

Unix is like a supergiant oil tanker: it carries a lot of weight, cannot be stopped or turned quickly, and does enormous damage while its owners and designers tell us how necessary it is to modern civilization.

Here's an example from *The Unix-Haters Handbook*, showing how humans talk to Unix: "sed 's /, / / g' | grep -v \$USER | sort | uniq." I've probably gotten this line wrong because (1) sometimes the open areas are spaces, and sometimes they are tabs (which look exactly the same on the screen or printed output), and this can make a difference in what happens, and (2) I don't have any idea what it does (and I used Unix systems for years).

The book records the incredibly arrogant attitudes of some of Unix's proponents. Take this comment from an international bulletin board, about the fact that Unix cannot undelete a file erased accidentally:



"Someday, you are going to accidentally type something like `rm *.foo` and find you just deleted `/*` instead of `/*.foo`. Consider it a rite of passage...."

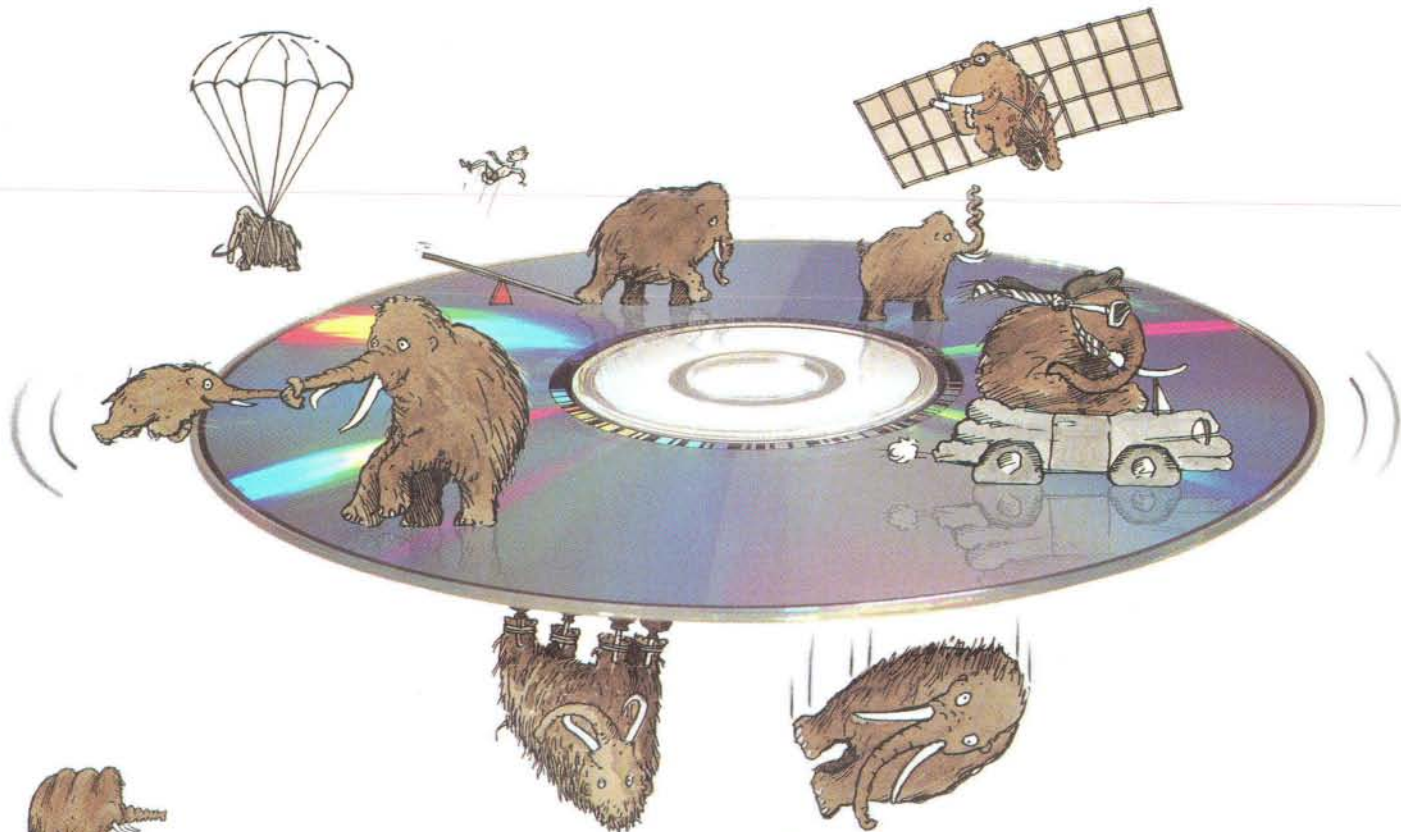
For non-Unixites I should explain that "rm" means "remove." The asterisk stands for any name, so `/*.foo` means any file name that ends with ".foo." But if you put in a space and type `rm *.foo`, then Unix removes all files (because of the space, it finds the ".foo" only after the dirty work has been done). And there's no Undo.

A "rite of passage"? In no other industry could a manufacturer take such a cavalier attitude toward a faulty product.

Here and there, the tone of *The Unix-Haters Handbook* becomes a little shrill, and once or twice its attacks miss their lawful prey – or go a bit overboard in praising competitive systems. But in the main, it is a well-justified cautionary tale. I hope it is widely read, its moral taken to heart. – Jeff Raskin

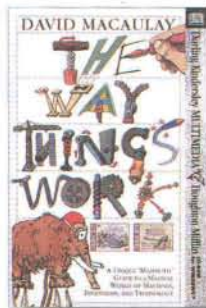
The Unix-Haters Handbook, by Simson L. Garfinkel, Daniel Weise, and Steven Strassmann: US\$16.95. IDG Books Worldwide: (800) 434 3422, +1 (415) 312 0650.

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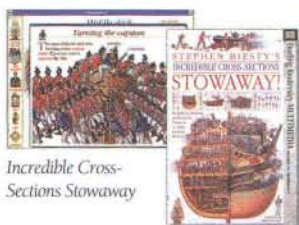


The Way Things Work

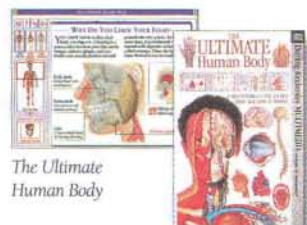
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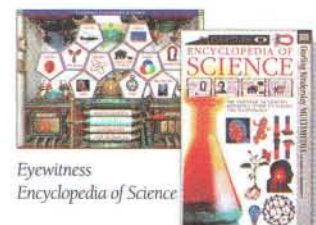
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Vangelis

Blade Runner
Atlantic Records
Access Code 1228

With the anticipation of a replicant waiting for an audience with Dr. Elden Tyrell, fans have eagerly awaited the unadulterated *Blade Runner* soundtrack, as originally written by Greek composer Vangelis. Finally, the waiting is over. This is the real stuff, kids – nothing like that cheesy orchestral cover we've put up with for all these years.

Vangelis here includes music omitted from the 1982 orchestral bastardization. One such track, "Tales of the Future" (written for the scene in which Rick Deckard – as played by Harrison Ford – wanders through the bazaar of genetically engineered animals) evokes the movie's haunting mood – an essential aspect of *Blade Runner* that probably no orchestra could replicate. Similarly, "One More Kiss, Dear" retains its distinct, old-new sound, as if the song's



crooner is being piped through a digital, Depression-era radio. Here, even the previously released easy-listening classics "Love Theme" and "Memories of Green" fit nicely with the rest of the music. (Heck, that jarringly goofy disco beat played over the movie's end titles works even better now.)

Dialog extracted directly from the movie has been incorporated into a few select tracks. Some of it doesn't work, as in "Blush Response," when Deckard's initial meeting with replicant Rachel and "father," Tyrell, goes on a bit long. In other cuts, the voices do accentuate: Deckard commanding his whirring, beeping Esper to scan a photograph in "Main Titles," and replicant Roy Batty's quiet, rooftop death scene in "Tears in Rain" offer eerie, spoken embellishments.

Just as the director's cut of *Blade Runner* was a must-see when it finally toured, this pure release is the must-hear counterpart to Ridley Scott's seminal motion picture. It will delight you as much as checking Dr. Tyrell himself. – Howard Wen

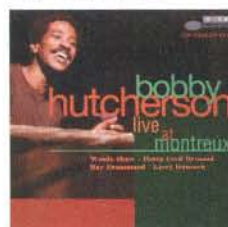
Bobby Hutcherson

Live at Montreux

Blue Note

Access Code 1229

Relive this truly vibrant blowing session. Vibraphonist Bobby Hutcherson's metronomic note-ness alone is mind-boggling, but the late trumpeter Woody Shaw is definitely the star of this disc, releasing serpentine melodies that explosively foray beyond any restrictive chord changes. His penchant for spontaneous polytonality is awesome, causing some brief moments of panic by an excellent rhythm section, which then rises to the occasion with ample harmonic support. Shaw's aggressive tendencies lend a sense of adventure to a style of music so open to such individuality. – James Rozzi



Various Artists

Nativity in Black: A Tribute to Black Sabbath
Columbia

Access Code 1233

Contributors to this disc honoring the mighty Sabbath (one of the less appreciated major influences of this decade) are limited to the hard rockers (Megadeth, Biohazard, White Zombie); this leaves a portion of the multifaceted Sab's ground untuned. Why not have Branford Marsalis explore the band's jazzy rhythms, Smashing Pumpkins dissect the subtle dynamics, or Blues Traveler illustrate Sabbath's live jamming prowess? Limitations or no, this album packs enthusiasm and apt pairings. One of the best tribute albums to date. – Paul Semel

Julian Cope

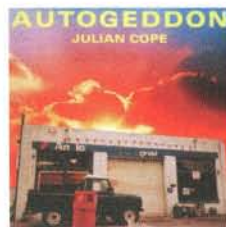
Autogeddon

American Recordings

Access Code 1230

After a career spent on this side of the big time, this former Teardrop Explodes leader at last emerges as an angry young man. Armed with an orchestra of enough whirs, blips, and pings to make you haul your stereo in for a simonizing. Saint Julian abandons all the polite pop hooks he once infused in such tame directives as "World Shut Your Mouth." Now, he growls, he's "just trying to drive the fuck around." On the highway to hell, no doubt.

– Mary Elizabeth Williams



Jean Sibelius

"Kullervo" Symphony, Opus 7 Helsinki Philharmonic; Paavo Berglund, conductor
EMI Matrix

Access Code 1234

This youthful work of Jean Sibelius (1865-1957) was not heard until relatively recently: early in his career, the composer prohibited further performances of it during his lifetime. Of the few recordings made since his death, this one, digitally recorded, remains the best. The program, drawn from the Finnish epic *Kalevala*, concerns a brash young man who seduces a maiden, learns too late she is actually his sister, then kills himself in his grief and shame. Despite Sibelius's reservations, this is an imaginative and powerful piece.

– Bryan Higgins

Cachao

Master Sessions, Volume I

Crescent Moon/Epic

Access Code 1231

That big bass sound you hear in classic mambo and rumba recordings owes it all to Israel López, known as Cachao, father of the acoustic contrabass. This homage is not a bunch of oldsters reliving past glories, but rather a survey of hot Latin sounds, from the exquisite *danza*, "Finally I Saw You," through classic *son*, *guajira*, rumba, and screaming *descargas*, or jam sessions. Actor Andy García put the recording together for the movie *Como Su Ritmo No Hay Dos*, but this band takes listeners on an exhilarating ride through the Cuban musical landscape.

– Dr. Rhythm



L7

Hungry for Stink
Slash/Reprise

Access Code 1235

These are four gals who aren't feeling so hot. And they let you know through one post-social-apocalypse, guitar-driven, distortion-laden spasm after another. Their '92 *Bricks Are Heavy* release (featuring the droning, over-produced "Pretend We're Dead") occasionally sounded like they were locked in your basement bathroom; by contrast, this release maintains an enticing, almost adamant – though amorphous – edge. Listen long enough to "Freak Magnet," and you'll bang your head so hard you'll end up walking around as pissed off and paranoid as they are.

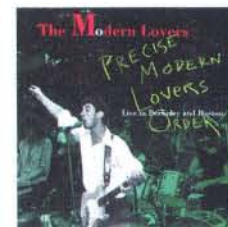
– Roderick M. Simpson

The Modern Lovers

Precise Modern Lovers Order
Rouner Records

Access Code 1232

Listening to these live recordings 15 years after I first heard The Modern Lovers sent chills down my spine. From the angst-ridden "Hospital" to the now classic "Pablo Picasso" and "Roadrunner," Jonathan Richman wrote intelligent and thoughtful songs at a time (1971-73) when virtually no one wrote with insight. His emphasis was on romantic love, as most rock of that time was, but Richman's viewpoint was different. This disc evokes rock's simpler past, yet is tinged with the edginess of the punk explosion to come. – Peter Herb



Palace Brothers

Palace Brothers
Drag City/Autotonic

Access Code 1236

I finally "got" this album on a slow, late-summer night. Somewhere down the street a man was bellowing, his cries interspersed with the Brothers's clumsy guitar picking and pale, hollow singing. In the other room, Ingrid coughed in her sleep, exactly at the end of "I Send My Love to You." Like the cool restraint of approaching winter, *Brothers* is something about an individual gospel, something about sadness. A raw, lonely simplicity – honest and humble enough to hold itself together for one more painted chorus, one more soft good-bye. – Patrick Barber

Microwave O' The Month



Killer Techno 3

Techno Nations
Sonic Records

Picture this: you're trapped in a throbbing club in the crispy hours of the morning, your ride has passed out in the corner, and all the good DJs have long gone home. *Killer Techno 3* is that puddle of barf you just slipped on. — Kristin Spence

MUSIC ACCESS

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At the beginning of each music review, you'll find a four-digit code for each album. To hear sample cuts, dial the 900 number above, entering this code when prompted. You'll hear up to three minutes of music, at 95 cents per minute. "Fast forward" by punching 3, louder volume 4, softer 5. To use Music Access, you have to be 18, have a touch-tone phone and dial from the US.

Code	Artist and Title
1228	Vangelis, <i>Blade Runner</i>
1229	Bobby Hutcherson, <i>Live at Montreux</i>
1230	Julian Cope, <i>Autogeddon</i>
1231	Cachao, <i>Master Sessions, Volume 1</i>
1232	The Modern Lovers, <i>Precise Modern Lovers Order</i>
1233	Various Artists, <i>Nativity in Black: A Tribute to Black Sabbath</i>
1234	Jean Sibelius, "Kullervo" <i>Symphony, Opus 7</i> Helsinki Philharmonic; Paavo Berglund, conductor
1235	L7, <i>Hungry for Stink</i>
1236	Palace Brothers, <i>Palace Brothers</i>

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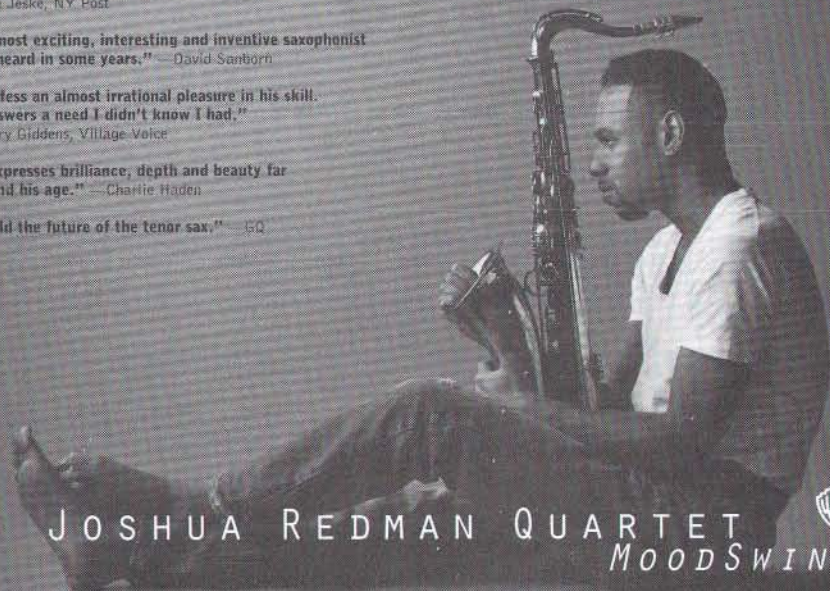
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The new album, on Warner Bros. Audio, and Compact Disc, ©1994 Warner Bros. Records, Inc.

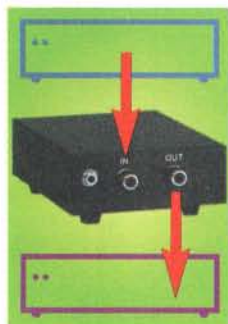


Video Dub Buddy

Maybe your favorite video-rental place is all the way across town, and you like to take home several movies at a time. You probably end up returning one or two videos unwatched on a regular basis. Wouldn't it be nice if you could rent the videos, dub copies to watch at your leisure, and return the original tapes?

It sounds reasonable, but the video biz is run by people who think that everybody on the planet is a potential big-time bootleg entrepreneur.

The main thing stopping you from copying prerecorded videos (besides owning two VCRs) is a copy-protection scheme called Macrovision. It's a little code embed-



Defeat copy-defeat!

ded in the video signal that scrambles the image if you try to copy a tape from one VCR to another. As with any technical problem, however, there is a solution.

The Macrovision Eliminator is a little black box that costs around US\$60. By running a video signal through the box, you can remove the Macrovision code and get a clean-looking dub every time.

Most video equipment stores don't advertise the Eliminator (or other similar Macrovision-defeating boxes). Try calling stores in your area. Or better yet, pick up any video equipment 'zine and check the ads in the back.

— Richard Kadrey
MVE 2000: US\$59.95. Distributors Unlimited Corp.: (800) 967 2603, +1 (417) 865 8280, fax +1 (417) 865 8667.

Crash Test Camera

Camcorders are supposed to let you capture the action in your life. If you're the couch-potato type, they do that just fine. But if you're like me — enjoying a life of badass outdoors action — most camcorders won't last an hour. Their delicate parts and circuits are quickly destroyed by dust, water, and rough handling. Forget about those "sports" camcorders; they're as water resistant as a cheap windbreaker, and they look like Barbie accessories with their garish colors.

Finally, someone has built a camcorder that tolerates real outdoors roughhousing, doesn't look and feel like a toy, and shoots decent pictures. Hitachi's VM-H71A comes in a rugged gray chassis with rubber seals for every hatch and button. The company says the VM-H71A is water-resistant and will float, though the print in the owner's manual says not to submerge it.

A day in my sea kayak with the VM-H71A showed that it can definitely take a licking and keep on ticking. I repeatedly submerged it in the Hud-



The Hitachi VM-H71A camcorder: Built to handle harsh treatment.

son River to get underwater shots, and the seals never leaked. Three times, I had to toss it to the floor of the boat so I could quickly paddle out of the path of charging ferries. This rough handling didn't seem to affect it at all, although I did end up with three lengthy shots of my feet and my rowing partner's butt.

Hitachi also says the VM-H71A can take 400 pounds of pressure. I didn't have a 400-pound weight handy, but I did subject it to the punishment of supporting my chair-bustin' 250-pound frame, and it never stopped running.

The camcorder has great features, besides: an image stabilizer that takes the shakes out of hand-held shots, a backlight compensator for shooting with the sun in your face, a jack for an external microphone, and a special remote control that starts and stops the camcorder and your VCR in sync so you can automatically edit videos. And the Hi8 format gives you a 60-percent sharper picture than VHS.

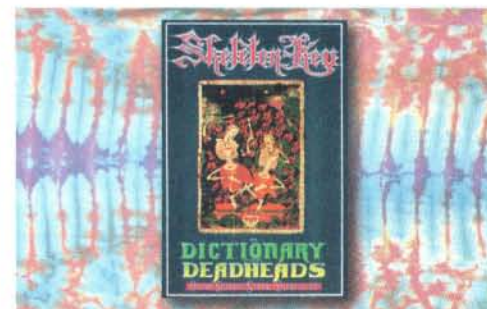
I've used more than 100 camcorders, but this is the first one I've really had fun with. — Brent Butterworth

Hitachi VM-H71A camcorder: US\$1,899. Hitachi: (800) 448 2244, +1 (404) 279 5600, fax +1 (404) 279 5689.

Skeleton Key

Probably the most memorable definition offered in *Skeleton Key, A Dictionary for Deadheads*, is that given for *getting it*. "Getting it," according to the book, is the term "said by heads about the moment they became a Deadhead." Is this book a modern-day Joycean epiphany or drug- or music-induced hysteria? Brothers and sisters, it is both.

After years of "being on the bus," authors David Shenk and Steve Silberman have put into words the experience and lifestyle that *getting it* implies. Sure, the untrained head may suspect that a couple of freaks wrote this book — filled with countless facts — to justify lives spent following a rock band all over the world and spending large sums of money on concert tickets and drugs. But Shenk and Silberman have done their homework, and the dictionary format serves the authors' purpose well: relating the history, happiness, and devotion of Deadheads.



Skeleton Key: All you need to spot "false Jerries" and more!

The result is a colorful, witty, and persuasive read. Explaining such Deadhead-speak as "Dirt Surfer" ("The joys of living on a tour bus are many, but hot showers aren't one of them.") is a passionate endeavor. One can't help but be lulled into the feeling that if you're not a Deadhead, you're missing out on a good time.

Luckily, the appendices included in the dictionary offer some tools for the trip. Directions on How to Tie Dye and on How to Become a Nethead ("You know you're a nethead when your Windows 3.0 background is a picture of Jerry Garcia, your cursor is a Steal Your Face skull, and sometimes you swear it's leaving 'trails.'") are the first steps along the road to salvation.

Hey, if Tipper Gore can be a Deadhead, anybody can. — Bob Kelly

Skeleton Key: A Dictionary for Deadheads, by David Shenk and Steve Silberman, US\$14.95. Doubleday/Main Street: (800) 255 4133, +1 (212) 354 6500.

Expert Backgammon

Expert Backgammon is the world's best commercially available backgammon program, or so claims Bill Robertie, the world-champion backgammon player and writer. (Then again, Robertie sells *Expert Backgammon* through his backgammon specialty business, so he probably isn't going to dis the program.) Modern backgammon was designed for gambling: it's primarily a game of skill, but one in which luck occasionally lets the novice trounce the most seasoned expert. While the element of chance prevents *Expert Backgammon* from winning every time, it knows lots of



Backgammon for blood.

tricks to make you lose your shirt, including when to double and when to decline your double.

Although I won one seven-point match against the *Expert*, I had to think long and hard about every move. On a dozen other games, I let my attention wander, and each time I found myself blown away. *Expert Backgammon* is good, nasty, and ready to jump on your every mistake. — *Simson L. Garfinkel*

Expert Backgammon for PC: Pro Version 2.1 US\$300, Expert Version 2.1 \$150. *Expert Backgammon* for Mac \$75. The Gammon Press: +1 (617) 641 2091, fax +1 (617) 641 2660, e-mail robertie@world.std.com.

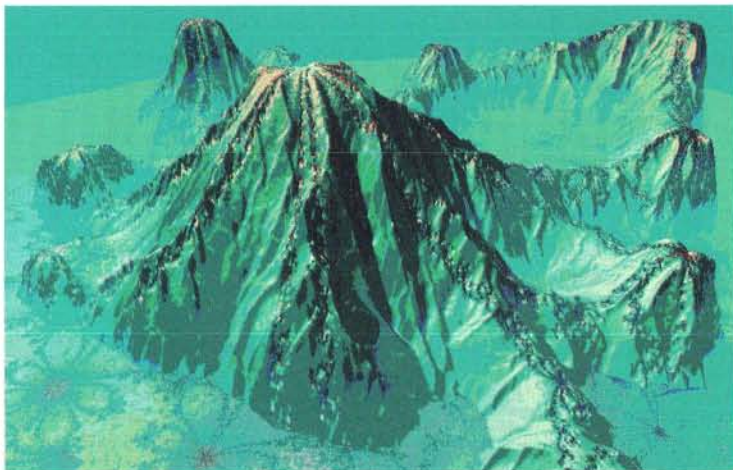
Build a World in a Weekend

It's easy to create images of intense complexity and beauty with Bryce, a landscape- and scenery-generating program for the Macintosh. Bryce works for a variety of media, including videos, games, posters, and magazine illustrations.

3-D graphics programs have made a lot of progress in power and features, but the key interface issue has been all but ignored. Bryce's interface is a work of art: it makes use of intuitive visual representation of operations and commands.

Bryce's scenes and moods vary enormously, from bright, vast horizons to dark, foggy alcoves. It's fun to play and experiment. However, Bryce is not limited to scenery generation. Primitives — basic three-dimensional shapes you can insert in your landscape and manipulate — allow for some very interesting surreal and abstract possibilities. A quick look at the sample images on the CD-ROM shows the wealth that Bryce offers for backgrounds and textures.

Nevertheless, with all the usability and high-res output, there are draw-



It took God a whole week to create the world; you can do it in a couple of days.

backs. Because some of the commands and controls are slider-based rather than numeric, it's sometimes difficult to repeat an exact command twice. But the major problem is rendering time. Bryce is a slow renderer and even slower at anti-aliasing. You can get an idea of what your image will look like quickly, but to complete it could take hours. After the first pass, an estimated time for rendering is displayed. But the figure represents only naked rendering time; anti-aliasing can sometimes take two to three times longer. There are a few features that help: rendering and anti-aliasing can be stopped at any point and later resumed, so you don't have to tie up your machine for hours at a time. There's another handy feature that allows you to save unrendered scenes in a folder, then open, render, close, and save for as many images as you want. This way you can go on vacation and leave your Mac rendering the whole time.

None of this speeds up the rendering time, however. The good news is that a native Power PC version that renders four to five times faster should be ready by the time you read this. — *Nick Philip*

Bryce for Mac: US\$199. HSC Software Corp.: +1 (805) 566 6200, fax +1 (805) 566 6385.

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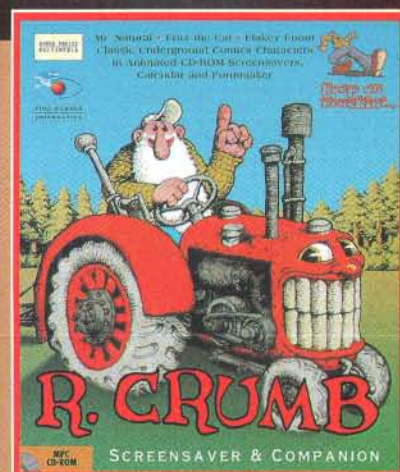
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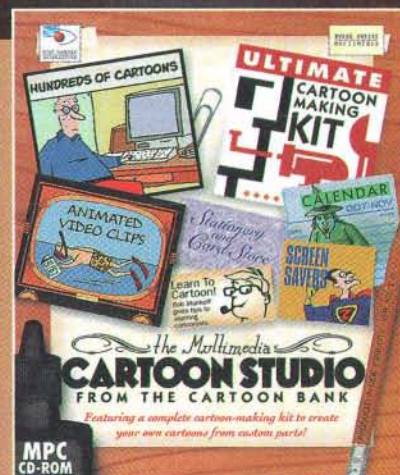
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Videogames

Videogame manufacturers have begun their pre-Christmas deluge of product announcements: struggling 3DO has announced plans for a PowerPC based platform, Nintendo and SGI won't stop bragging about their Project Reality system, and Sega is dropping hints about a new, multiprocessor system that uses Hitachi technology. The interesting question is, As videogame systems become more like PCs, why should anyone buy a videogame system at all? Pundits have predicted that "convergence" will kill the PC, but right now it's PCs: 1, consumer electronics: 0.

Intelligent Highways

When I think of intelligent highways, I think of computerized maps, self-guided cars, and an end to traffic. But the rapidly growing Intelligent Vehicle Highway Systems industry is focusing on the more prosaic ability to charge cars for road use without requiring them to stop. Electronic toll collection will eliminate delays at the tollbooth and will undoubtedly make private roads more acceptable. Yet the idea that a few more roads is going to help our major cities is laughable. Cities in Asia and Europe that have pursued the concept aggressively have little to show for it. "Intelligent highways" remains an oxymoron.

	Current Position	Position Last Month	Months on List
Videogames	1	—	1
Intelligent highways	2	—	1
Return of VR	3	1	2
Robotics	4	—	1
VLIW	5	—	1

HYPE LIST



Return of VR

Engineers and journalists no longer predict that VR will revolutionize the world by 1995. But VR's inevitability and ultimate significance is rarely challenged. The grandiose concept of VR as a completely new, revolutionary technology is the wrong model; the correct model is that of the slow, incremental development of a technological path that begins at multimedia and grows toward 3-D. VR is just Windows 18.5.

Robotics

Robotics have long faced the hurdle of unreasonable expectations. The public, fed a media diet of robot butlers and chirping R2D2s, finds even the most technically sophisticated robots laughably inept. Perhaps in reaction to this, the new trend in robotics is of conscious parody: hobbyist robots now exaggerate brute force and clumsiness; blinking lights have been replaced by heavy gears. Robot wars, the upscale equivalent of monster truck shows, which lack even the artistic pretensions of a Survival Research Labs performance, are becoming increasingly popular. It seems that with Pentagon funding drying up, roboticists have turned toward Hollywood.

VLIW

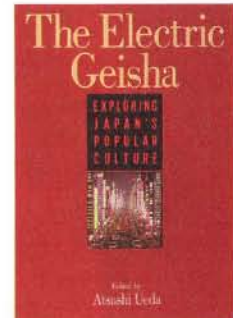
Like the objects they describe, terms for computer technology suffer from rapid obsolescence. The current example of this is "RISC," now found more often in ads than in technical papers. RISC's heir-apparent within the research community is VLIW — Very Long Instruction Word — where each machine-language instruction is many independent instructions. In a recent announcement, Intel and HP hinted that their next generation processor will be VLIW. True, it's a long way from announcements to silicon, but Motorola and IBM, which recently switched to RISC with much fanfare and self-congratulation, may have been leapfrogged by the competition ... again.

— Steve G. Steinberg (hype-list@wired.com)

The Electric Geisha

The *Electric Geisha*'s title is a euphemism for that seemingly inexplicable phenomenon, karaoke, which, like other customs, involves a complex agenda of escapism and ritual. Written by Japanese cultural critics, this book of 25 essays amiably and straightforwardly corrects many false impressions of Japanese life.

The Japan of today is in many ways like the Japan of 400 years ago. Most of the current social structure and customs originated or crystallized at the start of the 17th century, during the peaceful but restrictive Edo period. History itself can be read in the minutiae of everyday life: personal gestures, architec-



ture, and cultural mores.

Unlike in Europe and America, Japan's economy, commercial infrastructure, urban condensation, and technological outlook were well synchronized 400 years ago. These factors produced a Japan that is information-ready and technophilic. But they have societal costs. Intense cultural debates reveal a struggle between two entrenched and competing Japanese attributes: the love of new things and of tradition.

What we need are more books like this for the rest of the world. — Alan E. Rapp

The Electric Geisha, edited by Atsushi Ueda, US\$22.00. Kodansha International: (800) 788 6262, +1 (201) 933 9292.

Brave New Warrior

Welcome to the year 2014, when even the weather consistently sucks. (A tethered weather satellite is supposed to control it, but it, like everything else, is falling apart.) Chicago is a radioactive wasteland after a nuclear accident. The United States is in the midst of a second civil war; the country has fractionalized into various territories overseen by the likes of redneck Texans, Southern feminists, a militarized hamburger franchise (beef is illegal), and even the surgeon general, who's obsessed with physical and moral cleanliness. The conservative asshole president is standard fare — except his brain is in an android after a failed assassination attempt. America's only hope lies in the wits of a faithful soldier — 19-year-old Martha Washington.

In the earlier, award-winning comic-book series, *Give Me Liberty*, writer Frank Miller (*The Dark Knight*)



You've got to fight for your right to eat hamburgers.

Returns, Sin City) and artist Dave Gibbons (*Watchmen*) presented a satiric and disturbing vision of a future America. In the five-part sequel, *Martha Washington Goes to War*, the computer-savvy heroine (who has eschewed the typical skin-tight costume) seeks answers behind the "ghosts" who are sabotaging the war. Lo and behold, she stumbles upon a Utopian "Eden" in the process.

Publisher Dark Horse is planning on reprinting the five-issue series in a single volume (*Give Me Liberty* is also available as an anthology from Dark Horse). If you don't like comic books, try *Martha* anyway. While it has its share of action-packed adventure, it's happily free of the one-dimensional characters and simplistic issues that plague 99 percent of comic books. — Howard Wen

Martha Washington Goes to War, by Frank Miller and Dave Gibbons, US\$2.95 per issue. Dark Horse Comics: (800) 862 0052, +1 (503) 652 8815.

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Total Eclipse

Scary aliens threatening peaceful earth – the theme of hundreds of movies, and dozens of videogames. *Total Eclipse* for 3DO rolls all the above into one of the best alien-shoot-'em-ups ever.

Total Eclipse takes full advantage of 3DO's graphic and animation capabilities, as well as its seven-button controller. The rendering is extremely detailed and very convincing. Only the game's tunnel sequences tax the 3DO Interactive Multiplayer – here, the animation slows noticeably at times.



Alien spinout.

The real fun of *Total Eclipse*, however, is the ability of the FireWing you control to roll out of its normally horizontal alignment. You can fly sideways, upside-down – even do barrel rolls. The graphics rotate with fluidity for an absolutely outstanding effect. Disorienting at first, this new dimension in alien-shoot-'em-up maneuverability provides the key to staying alive in *Total Eclipse*'s various missions. – *James F. Stanek*

Total Eclipse: US\$59.99.
Crystal Dynamics Inc.:
+1 (415) 473 3400.

DoubleTake 100

The right way to do photography in the 21st century is DIDO: digital in, digital out. But the same schizos who designed the Apple PowerBook 540c (*Wired* 2.10, page 134) must've come up with the QuickTake100 camera, because its features alternate between slick and sick.

Slick are the 640-by-480 24-bit color images. This is more resolution than anything even close to it in price. In this regard it's an industry leader. It can tuck eight high-res images into its solid state memory (lots of memory: nearly a megabyte per big pic). And it won't forget them for a year, even if you take the batteries out. At half that resolution it can take 32 pictures, and you can mix resolutions on the fly. (640-by-480 from any digital camera, by the way, is not close to photographic resolution, and images are soft.)

Sick is that most people open the camera by putting their thumbs in what seems to be a finger grip and sliding the front cover: the "finger grip" is actually the lens opening, so this maneuver usually results in a perfectly smeared fingerprint on the lens. Also, if the camera's gone to sleep (which it does after five minutes or some other user-chosen interval), pressing the shutter button wakes it up. Of course, if it's not asleep it



QuickTake 100: Another Apple product co-developed by an idiot and a genius.

takes a picture. And you can't erase just one picture; it's either all or none.

Slick is the ease of installing the program and using it with your computer. It doesn't even care which serial port (on a Mac) you plug it into; it finds the right one for itself. And kudos to the designer of the clever cover over the serial port that slides out of the way; it's easy to use, unmistakable, and unbreakable.

Sick is the lack of threads for attaching close-up lenses, filters, or other accessories, not to mention the long horizontal distance (2 inches) between viewfinder and camera lens; it puts close things off-center.

Slick is the software. Using it is a no-brainer. And versions of this product are available for Mac or for Windows. (Apple is waking up!)

Sick is that the provided nicads are not recharged when you have the camera plugged into the wall; you have to use a separate charger. The spirit is willing but the flash is weak: its range is all of 9 feet.

Unless you like really expensive digital point-and-shoots or need quick images without being too fussy about image quality, I'd wait for Apple's second try. By the way, the pictures in Apple's ads for the camera were not taken with one. – *Jef Raskin*

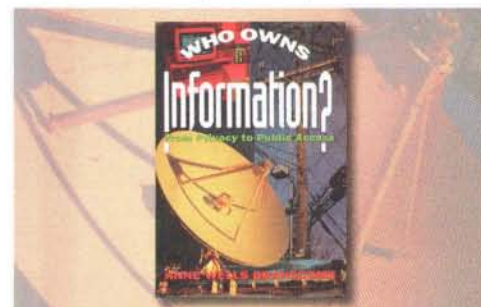
Apple QuickTake 100: US\$749, connection kit: \$99. Apple: (800) 538 9696, +1 (408) 996 1010.

Who Owns Information?

Anne Branscomb's *Who Owns Information?* includes all the information-privacy horror stories you could ask for. Unfortunately, just as each round of stirring Big Brother rhetoric reaches its climax, she drops in a bit of fishy logic (some people are just delighted to get those catalogs, that's just the price of modern medicine, and so on) purporting to explain why the problems are more complicated than you ever really thought.

The book is informative – sometimes. Details of the disputes over control of the Dead Sea Scrolls and scrambling of satellite TV transmissions are finally assembled. More often, though, it feels confusing, lacking a conceptual framework and showing startling omissions: Branscomb brushes past or skips altogether such topics as software patents, privacy torts, pre-employment background checks, trade secrets, noncompetition clauses, the European and Canadian data-protection regimes, the Fair Information Practices, and "opt-in" schemes that prevent secondary uses of your personal information without your express consent.

Read the final chapter first to get Branscomb's



agenda. She asserts, for example, that people should own their names and addresses, reducing informational privacy to a property right. Although this is an appealing proposition in the abstract – and might form one part of a larger puzzle – huge questions go unasked. First of all, what does this even mean? And secondly, what protection would such a right really offer in a world in which an individual cannot get insurance, medical care, a drivers license, or a job without having to sign it away? Perhaps, contrary to appearances, her proposal would provide legal armor for the inequities of the status quo by legitimizing these kinds of unfair contractual arrangements. Indeed, the only consequence that Branscomb derives from the view of names and addresses as property is that the industry should undertake voluntary programs to give people a sense that they're negotiating over the use of their personal information.

Branscomb's right about one thing: these issues will soon be up for grabs in a legislature near you. The information industry will be investing money and effort getting organized and making its views known. Will you? – *Phil Agre*

Who Owns Information?: From Privacy to Public Access, by Anne Wells Branscomb: US\$25. BasicBooks: (800) 331 3761, +1 (212) 207 7000.

Street Cred Contributors

Phil Agre (pagre@ucsd.edu) teaches in the Department of Communication at the University of California, San Diego.

Patrick Barber wonders what it would sound like if all the cars stopped. He is a writer.

Brent Butterworth is senior editor of *Video Magazine*, a semiprofessional videographer and a Chapman Stick player.

Roger Ebert's film reviews appear in the Microsoft *Cinemania* CD-ROM, which recently added a Mac version.

Simson L. Garfinkel (simsong@mit.edu) is a computer consultant and science writer.

Jim Gasperini (jimg@well.sf.ca.us), author of *Hidden Agenda*, is currently designing multimedia titles for several platforms, in Paris and New York.

Rishab Aiyer Ghosh (rishab@dxm.ernet.in) is a columnist, writer, and cypherpunk based in New Delhi, India.

Corey Greenberg is an Austin, Texas-based writer. His work has appeared in *Rolling Stone*, *Spin*, and *Stereophile*.

Peter L. Herb (plherb@aol.com) is an attorney in New York City who plays guitar and can be found most weekdays wearing a bow tie and suspenders.

Bryan Higgins plays the French horn and clavichord, writes fiction and software, and lives in Berkeley and Soda Springs, California.

Richard Kadrey (kadrey@well.sf.ca.us) is senior editor at *Future Sex* magazine as well as author of the novels *Metrophage* and the forthcoming *Kamikaze L'Amour*.

Bob Kelly, proud of his New Jersey heritage, is an editor at *big Whoop!* magazine in San Francisco.

Steven Levy (steven@echoyn.com) is a Fellow at the Freedom Forum Media Studies Center. He is author of *Hackers*, *Insanely Great*, and other books.

Nick Philip (nphilip@netcom.com) is CG artist at SFX lab in San Francisco. He is currently working on an ambient multimedia project in Tokyo called *The New Elements*.

Alan Rapp is the guy you think you've met before that you actually haven't.

Jef Raskin (raskin@jef@aol.com) created the Macintosh computer project and plays the contrabass recorder in F.

Bob Rossney writes the Online column for the *San Francisco Chronicle* and is still looking for a reason to buy a CD-ROM player.

James Rozzi is a freelance writer, woodwind musician, and teacher in the Orlando, Florida, area.

Dr. Rhythm (Alastair Johnston) is a letterpress printer and a teacher of graphic design who broadcasts over the San Francisco radiowaves.

Rich Santalessa is the former editor in chief of *Windows User* magazine. Currently he's the editor of *PDA & Wireless World*.

Paul Semel (beerhound@aol.com) has yet to find a great book store in Los Angeles.

James F. Stanek writes.

Steve G. Steinberg (tek@well.sf.ca.us) is a computer science student and the editor of *Intertek*, a technology and society journal.

Scott Taves (staves@aol.com) is a music journalist and director of special projects at Reactor, an interactive software developer/publisher in Chicago. He's partial to machine music.

Howard Wen was editor of *Thursday Magazine*, a tabloid covering the college music scene of Denton, Texas. It's an experience he's still recovering from.

Mary Elizabeth Williams (marybeth@well.com) is a columnist for the new magazine *Spec*. She is hopelessly mired in the '80s.

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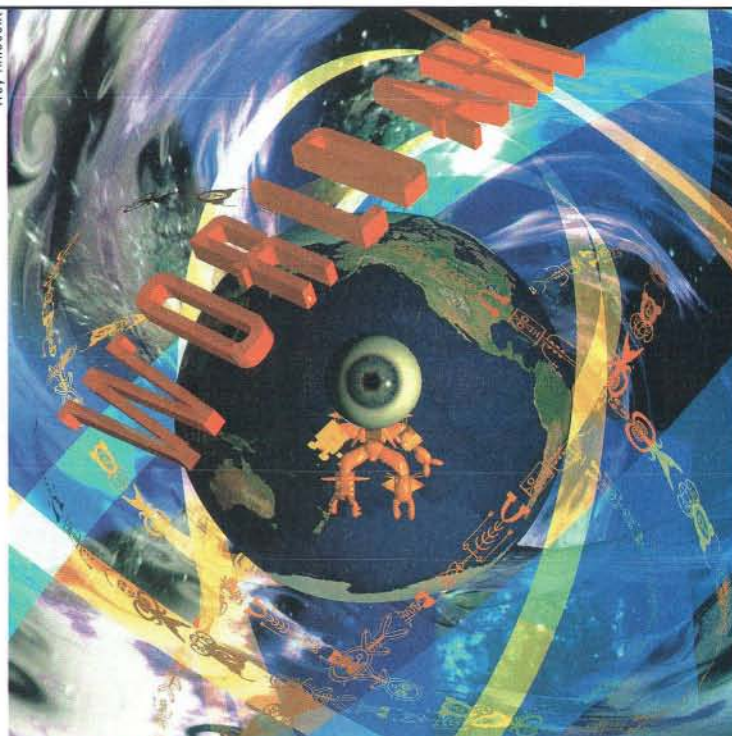
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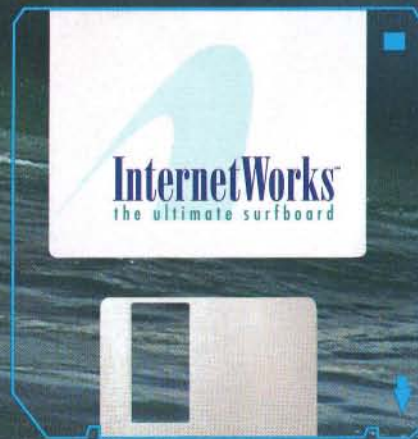
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Just Add Water: Decompression, Online Style

"Free, free, free!" What sounds like a bad infomercial for the Internet is actually the battle cry of Net surfers everywhere. (It might even be one of the reasons you got yourself wired in the first place.)

You've been hearing about the thousands of files out there, all free and waiting to be downloaded. You've paddled through the murky waters of ftp. You've gotten the inane commands down, you've remembered the IP numbers, you've even found the right directory at the archive site. But no one told you these files would be compressed. The more you look, the more *.verbiage* you see stuck to the end of each filename. What does it all mean? And how exactly do you extract these gems?

Most filename extensions (the *.verbiage*) signal either the type of file (in the case of graphics) or the compression method used (nearly everything else). Happily, with only a basic understanding of this system, you'll be filling your hard drive with readable, free stuff in no time.

Compression

Nearly everything on the Net is compressed. Besides saving disk space, compression has the added capability of combining multiple files into one neat electronic package. Fortunately for the novice, there is a finite number of popular compression styles.

PC: For those who surf in DOS- or Windows-land, be on the lookout for *.zip* files. While many other types exist, nearly everything is compressed with the PKzip package (ftp://oak.oakland.edu/pub/msdos/zip/pkz204g.exe). Self-expanding files bear the *.exe* tag, and will do just that: explode on their own. Simply run the program after downloading.

Macintosh: Decompressing files couldn't be much easier for Mac users. Grab the ubiquitous Stuffit Expander (ftp://sumex-aim.stanford.edu/info-mac/Compress-Translate/stuffit-expander-351.bin) and copy it to your desktop. Then, simply drop your downloads onto the Stuffit icon and let the program work its magic. The expander will handle *.hqx* (BinHex—a textual representation of binary files), *.uu* (UUencoded, see below), *.cpt* (Compact Pro, another favorite shareware com-

pressor), and, of course, *.sit* (Stuffit) files. The only time you really don't need Stuffit is with *.sea* files (standing for "self-extracting archive").

Unix: Unix files found on the Net generally come in one of two universal flavors. Those tagged with a *.Z* are compressed. Use the command *uncompress filename* to "add water," as it were. You'll also run across *.tar* files, which are archives containing collections of smaller files. To split these, try *tar -xf <filename>*.

Pictures

Almost every image you'll find out on the waves will sport a *.gif* or *.jpeg* extension. Both image types have built-in compression: once downloaded, they'll be ready to view. There are scores of viewers for every conceivable platform, with wide

What does all this *.verbiage* mean? And how exactly do you extract these gems?

ranges of features. Some of the more popular include JPEGView (ftp://med.cornell.edu/pub/aarong/jpegview/) for the Mac, and Lview (ftp://oak.oakland.edu/pub/msdos/windows3/lview31.zip) for the PC.

In addition to file archives, the Usenet newsgroups have become gold mines for pictures. Scores of images pass through a number of different groups each day, and almost all of them are UUencoded. (You'll see them marked with a *.uu*.) If you look at their contents, you'll see a nicely justified block of nonsensical characters. This is simply a text translation of the image data that needs to be converted. Often, a file is split into chunks and numbered (like "picture.01.uu" "picture.02.uu"). You'll need to strip the headers from each file, then recombine these files in a text editor. Then, simply type *<uudecode filename>* at your Unix Prompt.

For more information, surf the newsgroups *comp.compression* or *alt.binaries.pictures.d*, and consult their corresponding FAQs (both are also available from ftp://rtfm.mit.edu/pub/usenet/<name of newsgroup>). Just don't ask the all-too-common question, "What do I do with a *.xxx* file?" Unless, you enjoy being free food at an online barbecue. —Jeffrey Veen (jeff@hotwired.com)

Net Freakin'

Featuring *alt.alien.visitors*'s John Winston, Doctress Neutopia, and other assorted Net.yahoos we've grown to love, *alt.usenet.kooks* is Usenet's answer to the Residents' ultra tweaked *Freak Show* 'ROM title. A voyeuristic frisson courses through the lurking legions as Kook of the Month nominations are tendered ("Gawd, I love the smell of Usenet in the morning!"). Step this way if you wanna get wacky.

Can You Dig?

To experience life beyond the Net, cut on over to the University of Southern California's Mercury Project Web site at <http://www.usc.edu/dept/raiders/story/mercury-story.html>. There, you will control a live robot in real time. This 'bot moves sand with bursts of air and transmits pictures of any goodies you uncover. As you might guess, most of your time will be eaten up waiting for feedback, but the images of your physical presence in another part of the world are worth it. Though it might not seem so at first, there's an underlying theme connecting all the buried objects. The collective task is to discover that thread.

You'll need a forms-compatible Web browser for this hidden gem, and be prepared to wait a while: the queue holds up to 25 users at 5 minutes a turn (you do the math). But, wait and all, this spot definitely deserves a look. Who says you can't effect change via the Net?

For Serious Support, Hit "Send"

All too frequently, life's pressures are more than many of us can bear alone. *The Samaritans*, a network of benevolent volunteers in the UK who are trained and ready to talk with anyone who is suicidal or despairing, now have an Internet address. Feel free to seek their help, by e-mail, at jo@samaritans.org. Or, to contact them through an anonymous remailer that will protect your identity (but will result in a much slower response time), use samaritans@anon.penet.fi. They are there to help.

Doom Dump

"Welcome to the greatest DOOM ftp server in the world!" This lofty claim greets all who *anonymous ftp* to [infant2.sphs.indiana.edu/pub/doom](ftp://infant2.sphs.indiana.edu/pub/doom). Fortunately for Doom fanatics, this claim happens to be true. Not only the best, this site is also one of the most straightforward of its category, which is no small feat (there are literally thousands of Doom add-ons available, and more are created every day). The bulk of the infant2 library is composed of new Doom .wads – data files that hold the graphic information for id Software's 3-D action game. Most .wads are placed into alphabetical directories (a-c, d-f...), while some fall into other categories, such as *deathmatch* (for network play) or *combos* (.wads consisting of the 25 latest and greatest levels). It is a forum for closet Doom editors to showcase their work, and a chance for others to continually experience new levels of Doom!

Don't Kiss This Frog

Biology students and other amphibious surfers won't want to miss this site – one of the coolest things out on the Net right now. It's the *Whole Frog Project*, housed in a server at the Lawrence Berkeley Laboratory in Berkeley, California. This page is part of a published report about the LBL Whole Frog Project, which is setting out to conquer the problem of accurate extraction and representation of the 3-D structure of animals: not classical dissection, but elaborate data collection, analysis, and 3-D visualization. You'll need forms support, online image support, and color to really make it work, and work it most definitely will. All this fun and no pesky formaldehyde odor! You'll find this lily pad at <http://george.lbl.gov/ITG/hm.pg.docs/dissect/whole.frog.html>. Jump in!

Let's Do the Time Warp Again....

Rocky Horror: The stage play. The movie. The floor show. The newsgroup. Brad! Janet! Rocky! Bullwinkle! Shimmy your way over to *alt.cult-movies.rocky-horror*, and bring your virtual toast, squirt guns, and rice. Learn stage tips! Find out where you can ftp a library of complete audience participation scripts! (*ftp.netcom.com/pub/RHPS/docs/Script/*). I see you shiver with anticip...AAAAAshunnnnnn.

No Blood MUD

Want a MUD with detailed quests, weaponry, and enough violence to make Beavis and Butt-head queasy? Then you'll want to stay away from *Foothills*. Connect to this unique MUD, and instead of dungeons, you'll find five main public rooms designed solely for talking, as well as plenty of private rooms – for those moments when you want to block out the virtual riff-raff.

Catering to those who are more interested in wordplay than swordplay, *Foothills* has for the past two years steadily carved out a rather large niche in the Net's popular MUD scene. Originally based at Warwick University in England, this MUD has bounced back and forth across the Atlantic to finally settle at Boston University. In the early days, 20 or 30 people might have been connected at one time, but nowadays, thanks to a userbase in the thousands, it's not uncommon to see more than 200 people milling about the *Foothills* at any given time (sometimes arguing over who has the most entries on their "friend list").

Sound sappy? Perhaps. But there's something about *Foothills*'s easygoing atmosphere that keeps 'em coming back. Probably the view. To take a look for yourself, *telnet* to [marble.bu.edu](telnet://marble.bu.edu) 2010 and make up your own handle. When you're ready to settle down, find a superuser: simply ask about residency and you're in. Oh – and tell them SlyDog sent you.

Steer Clear

Sandbar alert: An epidemic of bogus newsgroup one-upmanship is throwing wake all over Usenet. Needless to say, *alt.this.group.has.the.longest.name.of.any.alt.group.there.is.just.to.mess.up.your.news.reader* and its ilk (*alt.son.of...alt.bride.of...alt.return.of...*) are null and void. Don't even waste your bandwidth.

A Tennen Hut

Yeah, it's a gimmick. But if you're a hacker who happens to live around Santa Cruz, California, you can now order pizza via the Internet. Pizza Hut is locally testing its *PizzaNet* system, and, if all goes well, the company plans to expand the service nationwide. *PizzaNet* was created with the aid of SCO, a Unix systems provider that helped Pizza Hut integrate its existing comm system with Global Access – SCO's Mosaic implementation. The *PizzaNet* welcome page asks for your name, address, and phone number. The subsequent pages give you product information and take your order. The order is automatically transmitted to the *Pizza Hut* nearest you (where they'll probably still use some teenager's VW for low-tech, analog delivery). Sorry, no e-cash accepted. (Yet.) To order a pizza, surf to <http://www.pizzahut.com>. To send your comments, e-mail webmaster@pizzahut.com.

Undercover Wardrobes

Boxers or briefs? Why? Are yours cotton or silk? That, in short, is the current topic of conversation on Usenet's *alt.society.underwear* – proving that, yes, some folks will talk about anything. *Wired's* attempt to broaden the discussion to the topic of underwires and Wonderbras sagged miserably: this is truly a one-track newsgroup. Boxers versus briefs may indeed be one of the great conundrums of our time. Join the debate on *alt.society.underwear*, but please ... be brief.

Save It for Later

Aaron Barnhart, keeper of the *alt.fan.letterman* FAQ, has been producing *Late Show News* every Tuesday since January of this year. This "electronic sheet" provides witty analysis, breaking news, and the weekly lineup for the Letterman show (other late-night talk shows are also highlighted). *Late Show News* can be found in

.sig file o' the Month

Davelozinski@csugrad.cs.vt.edu
lozinski@netcom.com

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"When you understand a species' art, you understand that species."
—Grand Admiral Thrawn

For Noamadic Surfers

Although his views are sought by the European press and his US lectures on politics and the media are incredibly well attended, you probably won't see linguist Noam Chomsky on *Nightline* or read him on the Op-Ed page of *The New York Times*. You can, however, find Chomsky-related material on the Net:

point your Web client to <http://www.contrib.andrew.cmu.edu/usr/tp0x/chomsky.html> or <ftp://ftp.cs.cmu.edu/user/cap/chomsky/>. There, you'll have democratic access to political articles, interviews (some of which outline his views on the Net), reviews, and material on the incredible documentary *Manufacturing Consent*. You'll even find some Chomsky GIFs – perfect for that intellectual screen wallpaper you're working on.

Usenet groups *alt.fan.letterman*, *rec.arts.tv*, *alt.zines*, and *alt.tv.talkshows*; at <ftp://mcs.net> in the directory / *mcsnet* . *users* / *barnhart* / *late-show-news*; or on the Web at <http://www.cen.uiuc.edu/~jl8287/late.news.html>. To subscribe to *Late Show News*, send e-mail to listserv@mcs.net with *subscribe late-show-news* in the body of your message.

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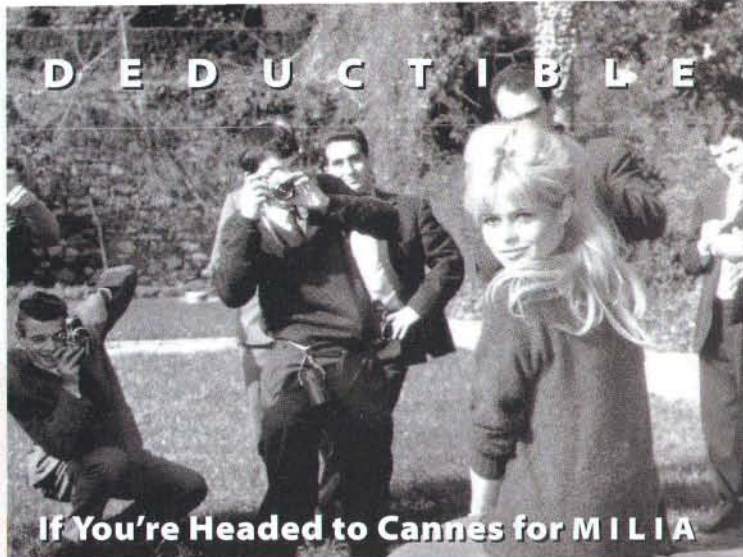
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If You're Headed to Cannes for MILIA

Thanks to its annual film festival, Cannes has become a household word, albeit an often mispronounced one. But the festival is just one of many events held in this fashionable French resort, including this year's MILIA conference. It seems the planners discovered what movie stars and rich Europeans have known for years – the sun shines and the francs flow in this Riviera wonderland. You can see it all along **La Croisette**, the elegant seaside boulevard lined with grand hotels and even grander restaurants. But don't just walk – promenade.

The pages of *Vogue* come alive on the rue d'Antibes and the other streets of Cannes. But fashionable boutiques aside, head straight to **Duquesne Telecom**, on 39 boulevard Carnot, and pick up the *prise gigogne* that you will need to log on at your hotel. You may also need a pair of alligator clips, depending on the phone jacks in your room.

At any of the hundreds of restaurants in town, you'll find sumptuous seafood and fabulous *foie gras*, at prices ranging from just plain expensive to ridiculously *chers*. **Tétou** boasts the best bouillabaisse in the world and celebrities, apparently, love bouillabaisse. You'll find less expensive eateries along the small winding streets of Le Suquet, the *vieux quartier* of Cannes. Undiscovered by Chanel and Armani, Le Suquet is a haven of curious shops, quiet cafés, and tasty treats – try the grilled delights at **Mashou**.

The Îles de Lérins, owned and inhabited by monks since 410 AD, are islands of serenity 15 minutes away from the self-conscious fan-

fare of Cannes. Buy picnic supplies at the open markets on rue Forville and ferry out to **St. Honorat**, the smaller island covered with eucalyptus and wild honeysuckle.

After the islands, rent a Renault and explore the more subtle charm of the Riviera's country towns. No more than an hour northeast you'll find Eze-Bord-de-Mer, a picture postcard town clinging precariously to a hilltop above the ocean. If you like post-impressionist art, visit the **Maect Foundation** in St-Paul-de-Vence. If you don't, then buy a *pastis* and watch the old men play *boules* nearby. When the game is over, find the restaurant-cum-gallery **Colombe d'Or**, where Picasso, Matisse, and others paid their bills with the brush.

Only 20 minutes from Cannes, Mougins is a must for gearheads and gourmands alike. The **Musée de Motos** worships the history of cars. And **Moulin de Mougins** is run by one of the most famous chefs in France.

A night in Nice is well spent at the **Bông Lai** on rue d'Alsace-Lorraine. At this brilliant Vietnamese restaurant the old chef will tell you not only what to eat but *how* to eat it.

Cannes has been called both "the pearl of the Riviera," and "a grotesquely over-hyped urban blight." Personal opinions aside, there are some general truths about Cannes (kän): you can't find a bad cup of coffee, you can never be overdressed, and the locals will sneer no matter how you pronounce it. – *Jessie Scanlon*

Tip of the chapeau to John Cummins, Ian Stewart, and my well-traveled America Online sources.

December 13-15

MVA '94: IAPR Workshop on Machine Vision Applications; Kawasaki, Japan

Now you see it, now your computer does. The International Association for Pattern Recognition brings together academics and industrialists for discussions ranging from machine vision algorithms and technical research to industrial applications, including mobile robots, factory automation, and security and navigation systems. Registration: ¥38,000 (US\$380) before November 30; ¥45,000 (US\$450) after. Contact: Mikio Takagi, +81 (3) 3479 0289, fax +81 (3) 3402 6226, e-mail takagi@tkl.iis.u-tokyo.ac.jp.

December 18-21

NAFIPS/IFIS/NASA '94; San Antonio, Texas

This joint event will combine the North American Fuzzy Information Processing Society Biannual Conference, the Industrial Fuzzy Control and Intelligent Systems Conference, and the NASA Joint Technology Workshop on Neural Networks and Fuzzy Logic. Papers, panels, and tutorials will consider possible applications of fuzzy logic (the National Information Infrastructure, financial networks, and other complex systems). Ah, yes – and the latest fuzzy products will be on display. Professor Emeritus Lotfi A. Zadeh, the father of fuzzy logic, will give the keynote address. Registration: US\$350. Contact: Uthra Venkatraman, +1 (409) 845 1870, fax +1 (409) 847 8578, e-mail nafips94@cs.tamu.edu.

January 4-7

MACWORLD Expo; San Francisco

While the rest of the world kicks back to recuperate from a hectic holiday season, Mac users will celebrate the New (computing) Year at MACWORLD. Tens of thousands of them are expected to race from booth to booth, viewing new product demos and clamoring for free buttons. And then, of course, there are the 200-plus conference sessions covering multimedia, design, connectivity, and more. Registration: US\$120, \$25 for exhibit hall only, before December 1; \$150, \$40 after. Contact: (800) 945 3313, +1 (617) 361 8000, fax +1 (617) 361 3389.

January 6-9

The 1995 International Winter Consumer Electronics Show; Las Vegas

How to Make the Consumer Electronics Show: The Recipe. Start with 90,000 frenzied manufacturers and buyers, stir in one of every kind of new audio, video, multimedia, and mobile electronics product, sprinkle in a few big-name industry executives like Michael Schulhof of the Sony Corporation of America (the keynote) and Microsoft bigwig Bill Gates. Blend all ingredients well. And don't forget to preregister. Registration: US\$10 before December 12; \$50 on site. Contact: +1 (202) 457 8700, fax +1 (708) 344 9018.

January 12-16

MILIA '95; Cannes

Last year's sellout début made MILIA, the International Publishing and New Media Market, the talk of the multimedia conference circuit. General sessions, workshops, and panels will cover specific issues of creative content, production, and distribution. With delegates from the creative and business sides of the industry, as well as from both sides of the Atlantic, MILIA is also an opportunity to negotiate licensing rights and international distribution deals. Registration: f2,965 (US\$550) per person, f2,195 (US\$400) each additional person, before November 30; and f3,498 (US\$647), f2,312 (US\$428) after. Contact: Diana Butler, +1 (212) 689 4220, fax +1 (212) 689 4348.



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Gang Wars

◀ 151 Mark's expulsion leaks out, all over the underground. How did it happen?

Some kind of a fight. Chris says Mark screwed him out of some information, Mark says Chris doesn't know what he's talking about. Who knows? But it's posted on bulletin boards from here to Germany. It's the talk of the hacker elite: Phiber Optik got into a feud with Erik Bloodaxe, and to hear Erik Bloodaxe tell it, Phiber Optik lost.

Eli has been thinking.

Maybe the Legion of Doom is elite simply because it exists. If it's not the only gang out there in the underground, it's certainly the only one that boasts a decade of history and dozens of members nationwide who answer to a Texas leader. It's the biggest. It's the baddest. (That we know of so far.) But if another group of hackers challenges the Legion's superiority – well, who knows what might happen?

There's an idea he's had for awhile, it turns

By getting together in Eli's bedroom for late-night hacking sessions that lead to carousing in computers owned by the phone company, they have attracted the attention of two of the finest lawmen on the frontier of cyberspace: New York Telephone investigators Tom Kaiser and Fred Staples.

Kaiser, who has been monitoring some of the teenagers' phones for months, awakens early one morning in August 1989 and thinks, Today could be the day that we nab the hackers. He already feels the summer heat through his shirt as he leaves his house on Long Island to make an early train to Manhattan. This morning he will tell the Feds about the case.

Having reserved the big conference room, Kaiser finds it full of phone company people and their invited guests – investigators from the New York Police Department special frauds unit and the US Secret Service.

Knowing that the technical aspect of the case might make it difficult for non-technicians to grasp, Kaiser and Staples explain the case in general terms.

"Yo, dis is Dope Fiend from MOD," the newcomer says in distinctly non-Texan inflection. One of the Texans (who knows who?) takes umbrage. "Get that nigger off the line!"

out, and one day in the summer of 1989 he tells Paul on the phone.

"MOD," Eli says.

"Mod?" Paul asks.

"M-O-D," says Eli, spelling the letters out. So what is it?

"We should call ourselves MOD," Eli says. It's like a joke. It's a finger in the eye of LOD. He explains that it's an allusion to LOD, the Legion of Doom. From L to M, the next iteration, the new "kewl dewds" of cyberspace. The boys from New York are the opposite of the boys from Texas. How better to define themselves?

The boys from New York can figure out who they are simply by opposing the Legion of Doom and everything it stands for. Mark will love it, right? Whatever it stands for. That's not important right now. What is important, Eli says, is the joke: MOD. It stands for nothing. It stands for everything. Masters of Disaster. Mothers on Drugs. Masters of Deception.

The Masters of Deception don't know it, but in the summer of 1989 they already face a threat far greater than the Legion of Doom.

"We may be coming to you with this case we have, and how should we do that?" Kaiser inquires.

"What have you got?" asks one of the federal investigators.

"We have three hackers," Kaiser says.

Mark, Paul, and Eli.

Many months will pass before anyone gets indicted.

There comes a time in any good history where the plot twists unexpectedly. Life is moving along, developing its own routine and rhythm, when all of a sudden, something – or someone – intervenes, and the pace accelerates, faster, and faster still. And the story hurtles off in a new direction.

One day, in the fall of 1989, Eli is cruising the familiar territory of cyberspace and decides to check out reports about some hot hacker in Brooklyn.

The Brooklyn hacker calls himself Corrupt. He's rumored to be a specialist. MOD can always use another specialist, and Corrupt supposedly knows more about the ubiquitous and powerful corporate computers called VAXEN (the plural for VAX) than the founder

of the Digital Equipment Corporation. Which would be some feat, considering that Digital manufactures the damn machines.

An expert who understands the intricacies and nuances of running VAX computers could really widen MOD's power base. A VAX master could help the other MOD boys navigate through some computers that for now seem tantalizingly obscure. Not only is VAX a type of computer prized by hackers, who love the versatility and power of the machine, but VAXEN also are indispensable to universities, corporations, small companies, database archives, and libraries all over the country. Oh yeah, and the government owns a lot of them, too. The government keeps a lot of its secrets hidden on VAXEN.

And Corrupt can crack them. Sign him up!

Now, there's plenty that Eli doesn't know about Corrupt. He doesn't know, for instance, that he lives with his mom in a third-floor walk-up apartment in Bedford-Stuyvesant (that's *Bed-Stuy*; you've heard of it as surely as you've heard of Cabrini Green and East LA), one of New York's toughest neighborhoods. Eli doesn't know that Corrupt will need no introduction whatsoever to the concept of MOD, because Corrupt is intimately acquainted with gangs. Out in the real world, out on the streets where you measure distance with your feet instead of your modem, Corrupt used to belong to a gang called the Deceptions. One thing Eli quickly learns: Corrupt's real name is John Lee.

John Lee dials "0."

It's early 1990 now, and John Lee is in MOD. The hacker leans against a bank of pay phones in the atrium of the soaring Citicorp building in midtown Manhattan. He's much too cool to check out his reflection in the plate-glass window of the Italian restaurant at the edge of the open space.

All around him, teenagers peck at phones like sparrows at a bird feeder, dialing and hanging up, trying random phone numbers. About 50 teenagers are hanging out, swapping information on how to break into computer systems, forming energetic clusters. Kids dial a number that someone said would connect to a New York Telephone switch. The number worked last week. The hackers had materialized out of nowhere at around 6 o'clock, just when the office drones fled the Citicorp building for the subway. The kids come every few weeks, on the first Friday of the month. No matter the season, they wear beat-up fatigue coats, baggy jeans, clunky-soled shoes, thick-thick black belts with square metal buckles weighing up to 5 pounds. They sport peach-fuzz mustaches

and slicked-back buzz cuts. You can't miss them. The gathering is their "meeting."

John Lee's induction into MOD is only natural, because of his intense thirst for computer conquests; all he wants to do is penetrate new systems. He's learned so much about hacking and cracking in the one year since he got his modem that he's caught up with the rest of the MOD pack. He'll do anything to get into a new computer. He breaks into a network, then turns over the information to the other MOD members. He's the scout; they chart the territory.

On the pay phone, John connects to an operator. "Hey, I'm up on a pole here," he says, using his deepest, most authoritative, most adult voice. If only the operator could see John, a tall, 20-year-old black kid in stubby dreadlocks, white T-shirt, and khaki pants so baggy they could hold a friend. He doesn't look at all the part he's playing – a white, middle-aged, tool-belted lineman doing a service check. But he sounds the part.

And maybe that's enough. Just maybe the operator will fall for his smooth line of tech-nobabble and give him an open line.

"Yeah, I need – damn."

Disconnected.

John hangs up.

Meanwhile down in Texas, the guys in the Legion of Doom are part of the mad rush of excited hackers who all jump onto one open phone line at once, crowding into a conversation like it's a rush-hour subway. Chris (aka Erik Bloodaxe) and a friend named Scott Chasin have been friends since the mid-1980s, when they both were coincidentally logged onto a Midwestern-based underground BBS called World of Kryton. Scott and Chris discovered they had a lot in common: both were babies conceived on the cusp of the 1970s, then raised in the secure style afforded the white middle class in Texas. They share the same hobbies: both do conference bridges, as they call them.

The phone line used by the Legion of Doom belongs to – well, let's say it has been temporarily liberated from a local phone company, allowing anarchic hackers to engage in huge transcontinental conference calls that bridge across this city, and through that state, as one kid after another gets onto the line. If you are on the line, and you have three-way calling on your phone, you can invite a friend to join the conference call, too. Simply hit the flash button that disconnects a call, then call your friend, then flash again. Your friend is three-wayed in now. And if he had three-way calling, he could recruit yet another caller to the conference.

These daisy-chains last for hours, for days, for marathon amounts of time that adults can't even imagine. There is so much to say. Bridges are a great way to get acquainted. You can take a tour of the world on a bridge, talking to one hacker in Holland at the same time you converse with somebody in New York City. In fact, a couple of mysterious New York newcomers named Corrupt and Outlaw brushed up against Texas kids pretty often during conferences. Chris and Scott have never actually met the New York boys, but they've heard of them. Vaguely. They've heard that Corrupt and Outlaw come from a place they dismiss as the "inner-city ghetto," but the New York boys seem to know their stuff.

One night in 1990, on a bridge, about five or six hackers – all kids from Texas, you understand – are hanging out on the line. What are they talking about? Random stuff. Chris isn't on, or so he later claims. Scott is on. Suddenly, another voice calls in to the conference, joins the group in midsentence. The unknown newcomer does not have an accent common to these parts.

"Yo, dis is Dope Fiend from MOD," the newcomer says in distinctly non-white, non-middle class, *non-Texan* inflection.

One of the Texans (who knows who?) takes umbrage.

"Get that nigger off the line!"

The newcomer is silent.

In fact, the whole conference bridge is suddenly silent, all the chattering boys brought up hard and cold against the implacable word. You might as well have slapped their faces. Interminable seconds pass. Who wants to fill that void?

That's it. As simple as uttering one ugly word. The racial epithet instantaneously moves northward over hundreds of miles of cable, ringing in the ear of John Lee, who sits at his Commie 64 in his Brooklyn bedroom way at the other end of the line.

That word hits John like a billy club.

"Get that nigger off the line!"

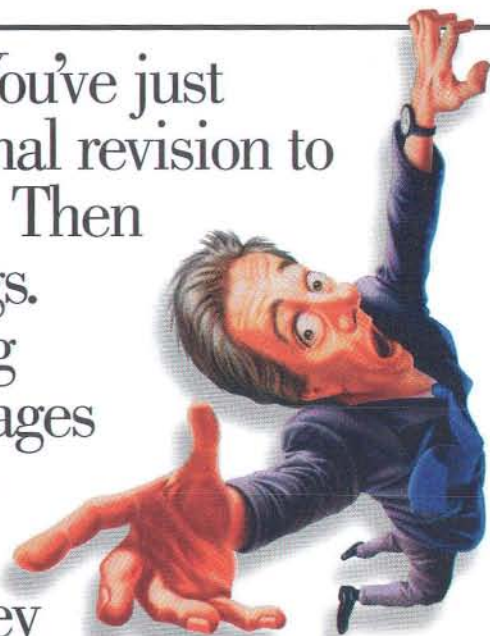
Then the newcomer speaks with a different accent, and the words he says to the white boys from Texas are these: "Hi. This is Corrupt."

Who had bleated that word? It's immaterial at this point; nothing will ever be the same again. Not for Chris and Scott, not for the boys from MOD, not for the loose-knit community that makes up the hacker underground.

With that one word, war has been declared.

Chris Goggans is John Lee's enemy – will be forever. But at this point in mid-1990 and after the fateful confrontation, John doesn't even know his nemesis by the name ► 202

It's 3:50 pm. You've just finished the final revision to the sales plan. Then the phone rings. "We're sending over 10 new pages of competitive info." Click. Good thing they lock the windows on this floor. You have to get it into the plan by the end of the day. What now?



Gang Wars

201 ► “Chris.” He just knows Erik Bloodaxe.

But John has decided to make his enemy’s life miserable. So first John must learn Erik Bloodaxe’s real name. Chris is so notorious in the underground that it doesn’t take John long to get the information he needs.

And it’s a good thing, since you can’t exactly call directory assistance in Texas and ask for a listing for a resident named Bloodaxe, as in “axe” with an “e.” So John bypasses directory assistance altogether. Instead he calls a Southwestern Bell computer, from there logs on to a switch and simply looks up Chris’s phone number for the three-bedroom, suburban-type house he was renting in north Austin.

Then the calls start.

Sometimes John uses his street accent to harass Chris. The phone calls are constant. It doesn’t help to hang up. The receiver is barely down before the phone rings again. And again. And again. Chris has to take it off the hook, and leave it off the hook for hours.

Sometimes John uses his street accent to harass Chris.

The phone calls are constant. It doesn’t help to hang up.

The receiver is barely down before the phone rings again.

And again. And again.

Sometimes, when they prank Chris, the callers say, “Here, talk to your friend,” and then before Chris can hang up, he hears a click, and then Scott is on the line, too, three-wayed into the call against his will, and he’s saying, “Hello? Hello? Who is this?”

In Chris’s mind, this type of harassment definitely falls into the category of Behavior That Is Unacceptable. It’s the kind of harassment he could help prevent, in fact, if he were to open his own computer security firm. He’s had the idea for such a company for a long time, but now the plan starts really taking shape.

He and Scott talk about the situation a lot, and they even come up with a name for the company they want to create. Comsec Data Security is the full, stuffy name, but neither of them ever think of it in that formal way. For Chris and Scott, the venture would always simply be known by a shortened name, Comsec.

One day during the winter of 1990, Chris gets hold of a copy of *The History of MOD*,

the “phile” written by Eli to commemorate the birth of MOD. Chris feels he has been teased and provoked enough; the MOD boys have logged into the Southwestern Bell switch that controls his phone service and switched his long-distance carrier from Sprint to AT&T. Chris doesn’t know this has happened until he tries to dial long-distance. He doesn’t hear the familiar click. So then, of course, he has to call up the phone company. Try explaining the situation to a clerk in the business office, and you’ll know why he’s so annoyed.

Chris figures that John is the one who switched his long-distance carrier on him. He also believes, incorrectly, that John is the author of a manifesto the northern boys call *The History of MOD*. So Chris gets hold of the Boswellian tale and decides to pull a little mischief.

Chris has an old computer program that will translate any file into a new “language.” When he feeds *The History of MOD* to the program, out pops a “jived” version of the document. The translation program simply

searches for certain words or word forms, and replaces them with others.

In goes the original language: “In the early part of 1987, there were numerous amounts of busts in the US and in New York in particular...” Out comes, “In de early part uh 1987, dere wuz numerous amonts uh busts in de US and in New Yo’k in particular...”

Using the jive program is the electronic equivalent of appearing in blackface – a crude, minstrel show in cyberspace: “Some nigga’ name Co’rupt, havin’ been real active befo’e, duzn’t gots’ some so’kin’ computa’ anymo’e and so ... sheeit, duh.”

Chris doesn’t consider himself a racist. He has black friends at work, he says. Ask him why he jived *The History of MOD*: he says it just seemed funny. Hilarious, he says. If you’re out to get someone, you’re going to do anything you can to make him mad, Chris says. Anything. He didn’t have a translation program to turn the MOD boys’ prose into, say, a *Lithuanian* accent or something, he only had a jive program.

So what was he supposed to do?

If you lived in the state of Texas, you’d understand, Chris says wryly: “Down here, we all have boots and hats. We all ride on the range.”

John sees a copy of Chris’s handiwork in early 1991.

He’s sitting in front of a computer system that looks like it was cobbled together from junkyard parts. He has a big old TV console for a monitor, a messed-up keyboard and his old Commie 64, bandaged with electrical tape. His computer is a street box, a guerrilla machine. Grunge computing.

And there it is on the screen, *The Jived History of MOD*.

“De legacy uh de underground ‘clandestine’ netwo’k continues and so’s duz de war (and ridiculing) against all de self-proclaimed, so-called ‘elite.’”

John can’t believe it at first; it’s too outlandish. He reads through it, slowly, amazed.

John finishes reading, then sits for a minute, staring at the screen, staring away from the screen – just kind of staring. And he thinks, This guy really doesn’t like me. This is aimed right at me, and only me.

Comsec opens its doors in May 1991, and the partners quickly make themselves at home in the airy Houston headquarters. Comsec has a huge vaulted ceiling with skylights and faux gas lights in the two corridors. Some days, Comsec’s founders skateboard down the long empty halls of the vast space and roll around in chairs. Chris is living in the back of the building, in an apartment with a big, white-bellied alley cat named Spud.

But there is a problem. Comsec has zero clients.

The officers of Comsec hold weekly staff meetings, which they all attend. They decide to distribute press releases advertising the availability of their security services. But to whom? As professed ex-hackers, they compile a list of likely clients. They scan the “philes” on underground bulletin boards to find the names of businesses whose computers have been infiltrated, then call the companies to offer their services.

The press releases do the job, because in June 1991, less than a month after Comsec’s official début, *Time* runs a story about the hackers.

The very next day the office phone starts to ring. And ring. You can’t buy advertising better than *Time*. Comsec has clients! One, a consultant representing the telecommunications industry, orders up some research on recent regional Bell company crashes. The

client pays US\$5,000 up front.

Of course, the publicity in *Time* has another effect.

Up north, the MOD boys are reading the stories.

John Lee has an ingenious idea for pranking the Texans. Why didn't he think of it before?

He puts his plan into action during that long, hot summer of 1991. It keeps his mind off the lack of air conditioning in the brown-stone apartment on Kosciuszko Street. His plan is to spy, and it's fairly simple. John logs in to the Southwestern Bell switch that controls Comsec's phone service in Houston.

Then John types commands to ask the switch if any of Comsec's phone numbers are engaged.

If they are, then John will know that a conversation is underway right now. A phone line is in use. So he issues another command, just like an operator would, to seize control of the line that carries the call. That easily, he splices himself into the ongoing conversation.

There's a quiet click on the line, but it's not the sort of noise you'd notice unless you were waiting for it. And no one at Comsec has any reason to believe that calls are being tapped.

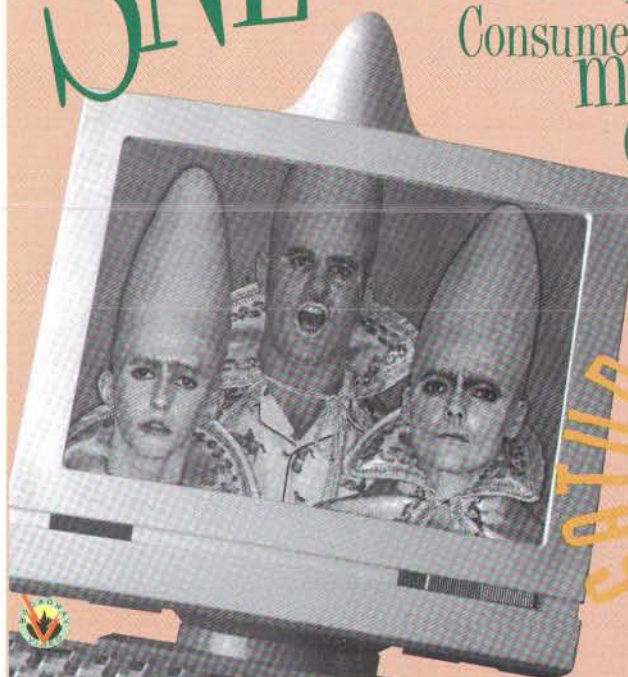
John eavesdrops routinely. That's the way to find out what the enemy is up to, a way to anticipate the Texans's every move before it is made. So here's John, listening in on Comsec's lines one afternoon when the security firm gets a call from a world-famous hacker, Craig Neidorf.

It is safe to say that no hacker is more famous than Neidorf in 1991. That is because Neidorf beat the federal government at its own game a year earlier. In the months since, his legal fight has become legend. (And for years to come, wary prosecutors considering indicting hackers will caution one another to make sure their cases are airtight, so they can avoid "pulling another Neidorf.")

The co-editor of the electronic magazine *Phrack*, Neidorf had gone on trial in Illinois in the summer of 1990, charged with fraud. The alleged crime: possessing and publishing a supposedly proprietary phone company document in an issue of *Phrack*. The government argued that the information was worth thousands of dollars, based on estimates from the phone company. But midway through the trial, the defense showed that the document's so-called proprietary information was publicly available; Bellcore sold the information to anyone who had \$15 to pay for a technical article. Stung, the federal prosecutors in Chicago dropped the charges before the case reached a jury. Yes, Neidorf was a hero to some hackers. But his notoriety ► 204

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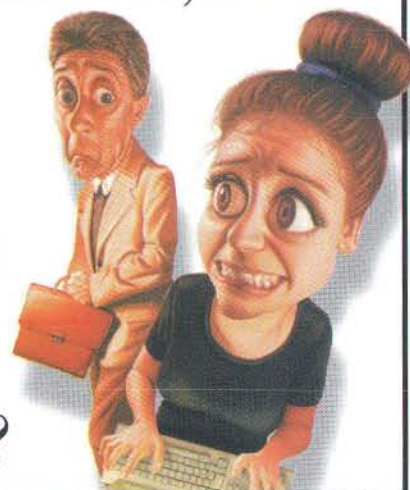


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You think she's finishing the proposal. She thinks you are. Surprise, neither one of you are. And it's 4 hours before the grant committee meets. Let's see, 16 new pages of data, 11 article reviews, 3,600 words sent by your partners in Istanbul. Who can type faster? Aaargh! What now?



Gang Wars

203 ▶ also made him a target for any denizens of the underground determined to make a name for themselves in cyberspace.

Now in the middle of a workday in summer 1991, Chris Goggans has answered the phone at Comsec and Neidorf is on the other end. (John eavesdrops noiselessly.) The phone call is just a friendly chat, but today Neidorf is frankly annoyed. The problem is that anonymous callers have been phoning him at home and harassing him over the line. He thinks he knows who is responsible, but he wants the prank calls to stop.

"Sounds like they're doing stuff along similar lines to what they're doing to us," Chris responds.

"Someone just called up my dad's house in Virginia," Neidorf says. Chris is not surprised, but he's outraged on behalf of his friend. He even has a theory about who might be behind the calls.

Had there been a trial, well, then the MOD conspiracy case could have set a precedent for the entire country, could have established a benchmark. But there wasn't a trial.

"Sounds like Corrupt," Chris says, recounting his suspicions that John Lee has also been pranking him in Houston. "It sounds like something he would do." At that moment, a second phone line rings in Houston, another incoming call for Comsec. Chris asks Neidorf to hold on a minute, then answers the other line. The voice on the second phone line says to Chris, "Yeah, that does sound like something I would do."

Chris is so mad he can't think straight. John Lee has been eavesdropping! On Comsec's private phone calls! For how long? How often? What has he heard? What has he told his little friends up there in MOD? If this gets out, Comsec will be a laughingstock!

Would you hire a computer security company that can't keep its own phone lines secure?

Chris calls the FBI, unaware that for months the government, relying on evidence of intrusions gathered by phone company investigators Kaiser and Staples, has been building its case against MOD. Whether Chris's calls affected the timing is not known, but the indictment against MOD is announced in July of 1992.

The indictment has 11 counts and charges Mark, Paul, Eli, John, and another MOD

member with illegal computer intrusion. Each count is punishable by at least five years in jail. Each count carries a maximum fine of \$250,000.

The case is so big, so sensational, so groundbreaking that the US Attorney himself calls a press conference in the lobby of St. Andrews Plaza, site of his Manhattan headquarters. He wants to announce the indictment to the media. It's a little off-putting, the rows of folding chairs hastily arranged with their backs to the metal detector and the bullet-proof US Marshal's booth. A stream of New York's finest – finest press corps, that is – slouches in and starts bitching for hand-outs. The indictment is a 25-page document dense with facts, counts, and legalese. The press release that explains what the indictment is trying to say is eight pages long. And then there are charts that Secret Service Agent Rick Harris arranges on an easel. This was before Ross Perot, remember, and the charts are a novel idea.

The basic point the prosecution is trying to get across is the national scope of the computer intrusions.

"This is the crime of the future," says US Attorney Otto Obermaier, a tall, patrician man in a dark suit. He points a finger to underscore his distaste for computer crimes. "The message that ought to be delivered from this indictment is that this kind of conduct will not be tolerated."

The MOD members are being charged with the most widespread intrusions of the nation's largest and most sensitive computer systems ever recorded. The government has decided to make an example of these teenagers from the outer boroughs. The message, which is what Obermaier calls it, is zero tolerance. If you're a hacker thinking of following in the footsteps of the Masters of Deception, think again.

There is hardly room behind the podium for all the authorities trying to get a piece of this one. There are the prosecutors. Then there are the agents from the FBI and the Secret Service, and there are the investigators from the US Justice Department's Computer Crime Unit.

Obermaier tells the press corps all about the crimes. He tells them the boys' intrusions have cost companies thousands of dollars in

security personnel salaries and lost processing time. But he doesn't tell them that the dangerous hackers are, in effect, just a bunch of teenage boys who got to be friends because they shared a hobby.

The story makes the *NBC Nightly News with Tom Brokaw*. It's the piece Brokaw ends with – a forward-tilting, something-to-think-about piece. There's a close-up of Mark teaching a computer class at the New School for Social Research in Greenwich Village. The piece closes with Mark talking to the NBC reporter on a dark and rainy street. Mark says that he's definitely the victim of political persecution.

Had there been a trial, well, then the MOD conspiracy case could have set a precedent for the entire country, could have established a benchmark by which the government could track down other so-called computer criminals.

But there wasn't a trial, because all the MOD boys had pleaded guilty over the course of the year. They had all given up. What was left after that? It was up to the prosecutors to recommend a certain sentence and up to the judge to mete it out.

The hackers who arrive at the Citicorp building on the first Friday of February 1994 wear heavy hiking boots, and thick-soled turf crunchers, and kicked-around, black-leather shoes that lace up, up, up their calves. Of course, if it were July, they wouldn't be dressed any differently. This is the uniform.

Tonight's meeting is the first gathering in nearly five years at which no one from MOD is present – Mark, Paul, Eli, and John are all in prison. Dozens of hackers are here, ranging in age from 14 to 40, far more attendees than in the days of early 1989. The world has changed since that heady time when Mark and Eli and John somehow found each other, somehow coalesced.

In fact, it's as if the rest of the world has caught up. What the MOD boys did for fun – recreationally cruising across continents of wires – has become a national pastime. "Net surfing" is a bigger fad than CB radio ever was, and people everywhere are buying their first computers and hooking up to online services that connect them to the world and one another. My mom. Your mom. Everybody's entranced.

So it's no wonder that the new members of an eager generation are filling the Citicorp atrium. Tonight, there's a hole where Mark used to be, a spot by the pay phones where he liked to stand patiently while a group of respectful protégés would gather to ask him

highly technical questions. Tonight you will not see his familiar blue-and-white bandanna, you will not hear the boom-and-heave of his voice. Tonight, Mark is far away. He arrived at the gates of Pennsylvania's Schuylkill County Prison late at night in January 1994, right after a snowstorm, and was whisked inside before his friends could say goodbye. He won't get out until November. The sentencing judge said that Mark, by his actions, chose to be a messenger for the hacking community. And so the judge said he had no recourse but to send a message back.

After six months of shock incarceration camp, John comes out thinner, more muscular, in fact in the best shape he's ever been in. In the fall of 1994, he heads back to Brooklyn College, where he's enrolled in the film-studies program. He's got lots of ideas for films he wants to make.

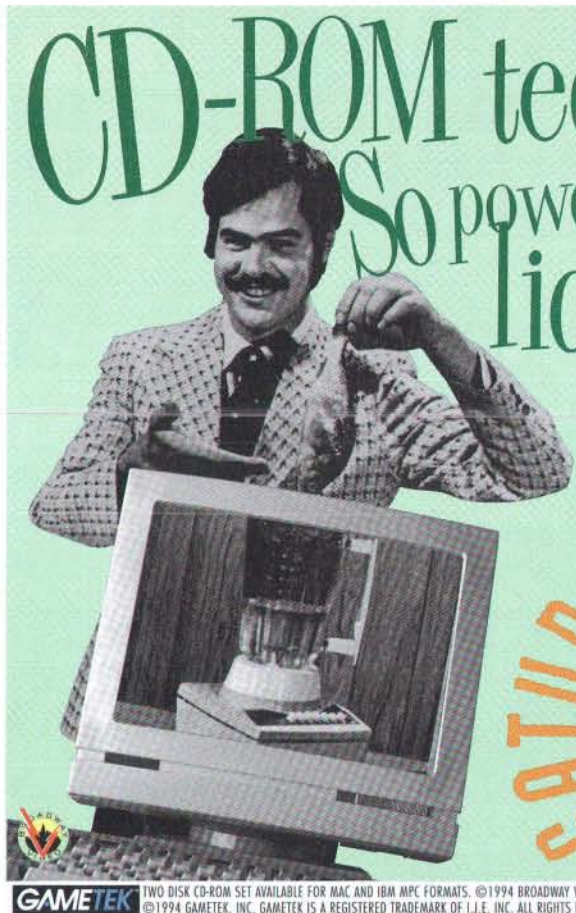
After doing time in federal prisons in Pennsylvania, Paul gets out in the spring of 1994. Mark is scheduled for release around Thanksgiving. For both, their days of hacking turn out to be good job training: Paul works for a company that traces missing persons through public databases. Mark keeps the computer system running at Echo, a Manhattan-based online service. Mark is so beloved among Echo's computer users for his smooth and efficient troubleshooting that the Echoids set up a fund while he is in jail so they can buy him a new laptop after he gets out.

The Legion of Doom and Comsec are just memories now. Comsec went out of business, and Chris Goggans is working for a large clone maker in Austin, researching advanced wireless networks. With other LOD members, he's also assembled thousands of messages - flames, gloats, electronic graffiti - from various elite bulletin boards in the 1980s and sells the collection through a company called LOD Communications. He sells T-shirts, too: at the December 1992 Ho-Ho Con, a hackers convention in Houston, the T-shirts are emblazoned with "The Hacker War" across the chest, along with a map of the United States depicting Chris's version of major battle sites, mostly Houston and Austin and New York.

On the back it reads: LOD 1, MOD 0. And there's a quote, attributed to Corrupt, which Chris says he got from a secret MOD database: "It's not just winning that counts, but making sure that everyone else loses." ■ ■ ■

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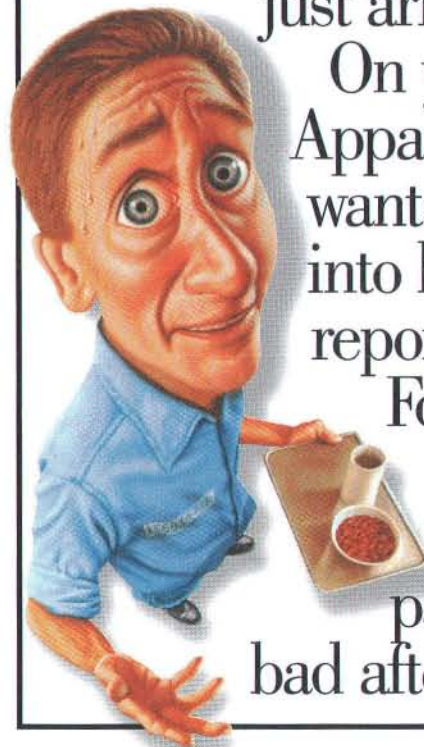
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prison without
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bad after all. What now?



Digital Art

◀ 158 first attracted attention in the mid-1980s with the emergence of the "Simulationist" group that included Jeff Koons and Haim Steinbach, asks: "If you use computer graphics, does the work remain on the screen? What happens to the Modernist tradition of tactility, scale – all of the elements that fall under the rubric of presence?"

Relying on metaphor to define their work, some digital artists refer to a kind of mapping. For example, the South Africa-born, New York-based artist Laura Kurgan, who approached art through architecture, describes herself as "a cartographer of different virtual realities." In shows at noncommercial spaces such as The StoreFront for Art and Architecture, she has set about charting the constantly fluctuating parameters of cyberspace. In *You Are Here: Information Drift*, she linked her exhibition room to the network of Global Positioning Satellites, a military technology now available for commercial use. Display monitors in the installa-

tion showed how the satellites' transmission changed randomly over time, as the signal seemed to emanate from anywhere over a 100-meter area. Despite an enthusiastic critical response about this exploration into the architecture of information, Kurgan's work has so far been ignored by galleries. "One dealer said, 'I love all this new technology stuff,'" Kurgan notes, "but how can I sell it?"

Producing digital art, though it may defy the old art-market rules, doesn't necessarily consign artists to commercial failure. Ronald Jones, for instance, takes objects out of his virtual reality sets and has them made into sculptures to sell as high-priced traditional art works. Michael Joaquin Grey, who manipulates genetic algorithms and neural nets, has programmed a supercomputer to simulate the evolution of "life forms" that are first plotted as simple shapes, such as spheres or ovals. These shapes begin to deform into blobs, and then become more complex as random numbers are fired at them. The resulting appearances range from jellyfish squiggles to primordial alphabets,

which Grey can "photograph," or transform into 3-D sculptures using stereolithography, a process involving lasers. Grey's method mimics that of scientific research – but for artistic ends. Like a botanist or zoologist, Grey breeds and obsessively catalogs the new forms he creates, examining thousands of variations before finding a series that particularly appeals to him. "Science offers only one kind of narrative," says the 31-year-old Grey, who studied genetics and art at the University of California at Berkeley and at Yale University. "I wanted to be a heretic to science and create my own cosmogony." His diaphanous shapes, displayed at the juried, highly competitive Whitney Biennial Exhibition, reminded me of viruses, as though offering a metaphor for the alien beauty of these ancient human predators.

Like the work of Karl Sims (*Wired* 2.09, page 115), Grey's project also suggests a new kind of art that attempts to embody otherwise abstract structures of information. The formal lessons of art history – the way objects

can create an emotional impact when presented in the "white cube" of a conventional gallery or museum setting – might provide the framework for works that change as the data available to them changes. This kind of aesthetic activity might generate less a single precious object than a continually evolving network; the artist becomes less the solitary master of Modernism than the system's builder and administrator.

Other digital artists search for parallels in the history of earlier mediums. Gregory Rukavina's computer animations and large-scale prints explore the development of montage – the system of editing film that eventually became the dominant language of cinema. He seeks to "break down" film technology in unfamiliar ways: "One early movie theater in Japan had seats perpendicular to the screen," he explains, citing a film theorist's essay on Japanese cinema. "They weren't sure if the beam of light from the lens wasn't as aesthetically important as the image on the screen." Such seemingly blind alleys inspire Rukavina to investigate nonlin-

ear aspects of the film medium – he splices the soundtrack, for instance, back into his visual images.

Rukavina, like Grey and Jones, ends up with analog works that can be shown in traditional gallery settings. However, some critics think this kind of solution is provisional at best. "Transforming the new medium back into traditional forms is really awkward," says Lanier. "That's going to last about five minutes." Not that he has an answer: "At the moment, the new media confounds the economic system of the art market."

Museums Foray into Cyberspace

Since galleries refuse to handle most digital projects – especially if the work lacks an analog component – museums and other institutions are taking the lead in commissioning and showing works in this area. Last fall, the Guggenheim museum responded to all the hype about virtual reality with an exhibition of VR work at its SoHo location. The exhibit included works by Thomas Dolby and Jenny Holzer, as well as a VR walk-through of an Egyptian temple built at Carnegie Mellon University. I visited the Holzer piece – which consisted of a fuzzy, bombed-out, Bosnia-like landscape in which disembodied voices spoke of unspecified tortures from empty houses. Although Holzer may have meant to comment on the fact that VR was developed by the military, the work seemed to me to be an unhappy conjunction of a trendy new technology and a stridently charged subject matter.

Lanier, virtual reality's first crossover, believes that the medium's artistic possibilities have yet to be discovered. "There hasn't been any virtual reality art made yet, in my opinion," says Lanier, "and the way museums and other patrons have handled virtual reality is stupid and insulting to the artists. They've defined the importance of the artists in regard to their celebrity rather than their work." Kai Krause, the software innovator behind Kai's Power Tools for Photoshop, describes most of what has been produced so far as "contrived plays with technology for its own sake." Krause estimates it may be at least 15 years before "deeper artistic expressions will emerge."

Perspectives like those of Krause and Lanier may be correct, but they are also premature. At least some artists should get the opportunity to play with this expensive new form – whether or not VR becomes the 8-track tape of the 1990s. The Banff Centre for the Arts in Alberta, Canada, has put the tools of VR in the hands of artists, after purchasing an ONYX Reality Rack with funding

from the Canadian government. The eight projects commissioned over a three-year period for the center's Art and Virtual Environments project included works by Native American painters, multimedia theorists, performers, and installation artists. (The projects were completed last spring, and documented in *Immersed in Technology: Art, Culture and Virtual Environments*, to be published in 1995 by The MIT Press.)

One of the Banff artists is Perry Hoberman, whose earlier work featured karaoke machines and floor sensors that activated household gadgets. Hoberman says he arrived at Banff unwilling to entirely follow the center's program. "The assumption was the pieces would use headmounted displays, but most of us balked at that. We tried to find ways to subvert their program," Hoberman has his own views about VR. "Not only is the image quality of virtual reality still so poor, but also I hated the idea of doing something for just one person to see."

In the end, Hoberman's *Bar Code Hotel* did away with the immersive headset, substituting a 3-D projection screen and glasses. In the piece, several viewers are given bar-code wands and put in one room covered with bar codes that have simple directions such as "grow" or "fight" or "suicide." Using the bar-code wand, each participant creates an object (a common thing: a paper clip, hats, or sunglasses) that appears on screen. The viewers direct their objects to interact with each other through the bar-code command. Besides its high entertainment value, Hoberman's work also comments on the sad, almost suburban, emptiness of VR.

"I called the piece *Bar Code Hotel* to reflect the limits of interactivity," says Hoberman. "When you say something is interactive, it sounds like you should be able to change it somehow. But generally the choices are very restricted, and leaving is like checking out of a hotel room: the work returns to its pristine condition, and there is no evidence you were ever there." Hoberman says that he has received more attention for his Banff piece than for his earlier work, simply because it involves a costly high-tech system. This irritates him somewhat, because, like most of the artists I spoke with, he is skeptical of the glitzy technology that may attract attention but that can never substitute for genuine artistic vision.

At the Whitney, David Ross dismisses VR. "Virtual reality is such a costly tool that you either get an analogy for what somebody is doing in another format or a room with things in it," he says. "An art medium really can't flourish until it reaches a level of per-

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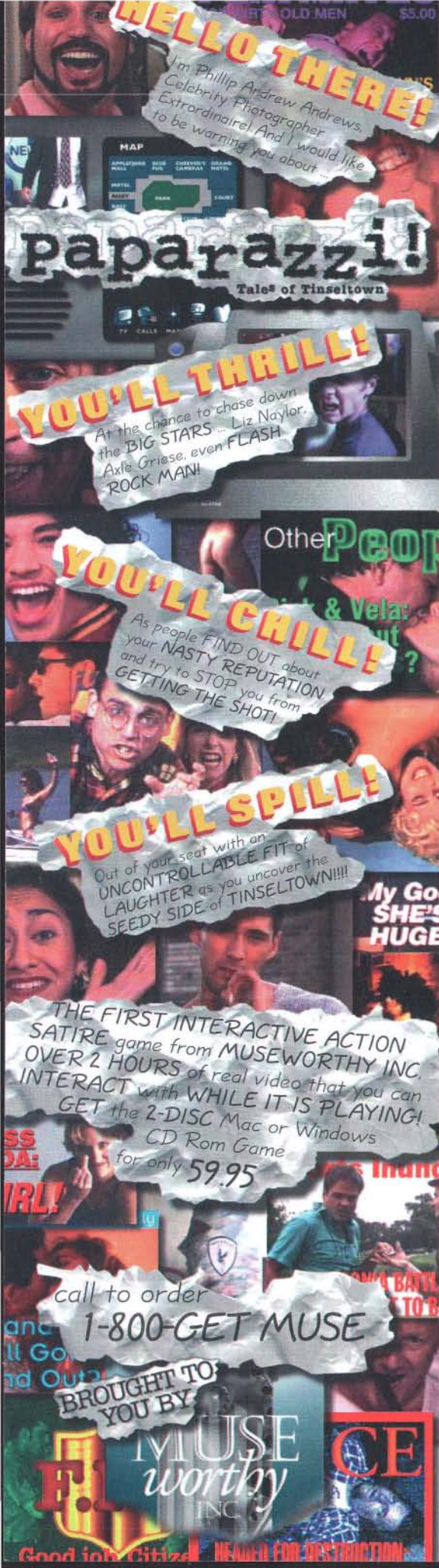
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Digital Art

◀ 207 sonal capacity, until it becomes like a crayon or a pencil." Ross has saved up his enthusiasm for the artistic potential of the Internet – both as a medium and as a future distribution system. "The video artist Nam June Paik used to say that someday the TV guide would be as thick as the Manhattan Yellow Pages and that every artist would have his or her own channel – this could soon become true if every artist gets his or her own SLIP connection." Although Ross doesn't foresee artists beginning to make money through the Internet in the short term, he thinks eventually pay-per-view systems may become popular ways of attracting an audience.

Last summer, the Whitney Museum opened a conference on Echo, a small but culturally hypercharged online service based in New York City. Ross and members of his curatorial staff presented forums on subjects such as race and pornography, allowing Echo members to interrogate and second-guess the experts. I tuned

around a few "art stars." Art-world politics might force places like the Whitney to promote the same old celebrity system. But the almost unlimited distribution power of the Internet could give artists a chance to reach a vast new audience, if they take matters into their own hands.

Technology and Craft

It is, perhaps oddly, the Renaissance artists that I kept thinking about as I explored the issues of art and digital technology with contemporary artists and theorists. During the Renaissance, art and science fit together in a confluence not seen since – breakthroughs by Masaccio, Filippo Brunelleschi, and Leonardo da Vinci were both artistic and scientific revelations. Rules of perspective formulated by the architect Leon Battista Alberti in the mid-15th century offered artists an objective system for making paintings based on Euclidean geometry. Opposing the flat anti-illusionism of medieval panels, Alberti noted that painters should compose their works as if facing "an

"The art world is scared to death of this stuff," says Laura Trippi, a curator at the New Museum of Contemporary Art. "We're seeing a breakdown of the art object which reflects the fact that the field of fine art is itself breaking down."

in, fascinated by the specter of the director and curators of the venerable Whitney fervently defending their positions against Echoids with names like neandergal and Richard Milhouse Headcharge.

The Whitney, Ross tells me, is also developing a Web site. "A lot of the work that interests me in this arena can't appear within the museum's solid architecture, but only within the invisible architecture of the Internet," he says. His inspiration? *The File Room*, a work developed by Antonio Muntadas, a New York- and Barcelona-based artist, in conjunction with the Randolph Street Gallery. A Mosaic site, *The File Room* archives material about art and censorship from around the world. "We are going to commission artists to create works for the Whitney site," says Ross, who plans to tap "the 'A list' of artists you might want to see in this medium, from Laurie Anderson to Robert Rauschenberg."

Although Ross's engagement with the medium demonstrates courage and foresight, it will be a shame if the Whitney resorts to his "A list," which will only further centralize power

open window through which I see what I want to paint." It hardly seems a coincidence that the most common graphical interface for today's computers is called Windows – information-age windows that open to reveal packets of data rather than realistic pictures.

Eventually, computers and the Internet may force artists out of the increasingly esoteric discourse of the art world. A broader audience may demand that they reintegrate their work with larger issues related to science, technology, and humanism. "I would like to see a return to that classical breadth of inquiry that artists were able to make in the Renaissance," says Michael Joaquín Grey.

Computers may also force radical artists to return to a notion of craft. In the contemporary art world, painstaking studio process often seems to matter less than an up-to-the-minute ironic pose. Artists of the past had to grapple with techniques ranging from draftsmanship to fresco painting if they wanted to achieve greatness. Their creative inheritors may have to master digital tools if they hope to reach beyond the restrictive walls of galleries and museums. ■ ■ ■

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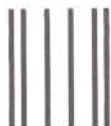
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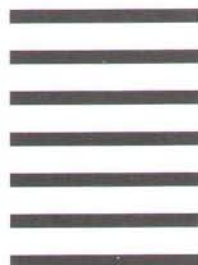
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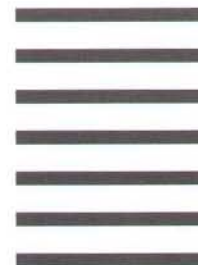


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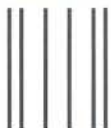
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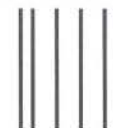
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NTT

◀165 experience in Thailand – revenue has turned out somewhat lower than originally estimated. In some cases help from the government or other public sectors may be needed to launch the initial growth of the market.

In Japan, some observers say that the global information infrastructure vision is an attempt by Americans to push their technical standards on the rest of the world, insuring that new markets will be dominated by US companies. These critics encourage Japan to come up with its own original standards and try to persuade the international community to accept it.

That is a bit too extreme. We need international harmony as far as standards are concerned. As a general trend, some kind of glob-

the Ministry of International Trade and Industry announced its Program for Advanced Informatization. The Ministry of Posts and Telecommunications plan set a goal of laying fiber-optic lines to all homes nationwide by the year 2010, and projected that the ¥33 trillion to ¥53 trillion needed to build it will create a new market worth ¥56 trillion per year. [The Ministry of Posts and Telecommunications report stated that the new network should be built primarily by the private sector, with the government playing the role of guide, ensuring fair competition and protecting consumer rights.] Both the report and program are strongly influenced by the White House's National Information Infrastructure initiative. **What is your view on these plans?**

It is good to have both ministries making proposals to the Japanese telecommunica-

We have competitors in the long-distance market, in the local loop, and in mobile telephony, but no one is trying to compete against NTT in all these markets. Real competition would be better not only for the competitor but for us as well.

al information infrastructure will sooner or later be built. Vice President Gore is encouraging the extension of advanced communications into developing countries. To make a telecom market, you need a global information infrastructure to link countries to each other. Encouraging "democracy" is also an important role in US strategy. Assuring the free flow of information to citizens, be it good or bad, is a fundamental tenet for any democratic society, and a global information infrastructure is a tool to propagate democracy and free society. However, there are other approaches to democracy and economy in the world – in Singapore, for example – and the values of the West are not always perfect or universal. These are very difficult issues, sometimes beyond the domain of the communications industry and technologies.

The Ministry of Posts and Telecommunications issued its policy report on the Next Generation Infocommunications Infrastructure in May 1994. At the same time,

tions industry. The two reports are not fundamentally different. The Ministry of Posts and Telecommunications report made it clear that the government is not going to directly build the infrastructure, but when it comes to applications, the government's role as a lead consumer is clearly stated. This is a very good direction.

The same is true for the Ministry of International Trade and Industry report. In September 1994 we started "high-speed backbone" experiments linking supercomputers in national universities and research institutes. This is one example of government involvement in the application area. We will expand the project early next year with more multimedia applications and with private companies and end users as well. We need to explore more applications with real end users.

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NTT

There are other approaches to democracy and economy in the world – in Singapore, for example – and the values of the West are not perfect, nor are they universal.

In order to advance the entire telecommunications field, we need a good understanding of the latest technology. The regulators also need a good understanding of technology. Regulation is a big issue. There are regulations which simply do not match changing times or changing technology.

NTT is often criticized as being too big, enjoying the lion's share of the market and not pushing the market forward. Do you need some competition to stay sharp? Should NTT be broken up as AT&T was?

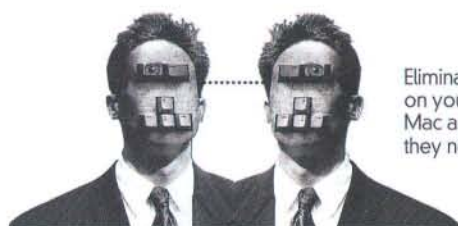
The telecommunications industry in Japan is still a little uneven in terms of competition. The Japanese telecommunications industry's social and geo-economic structure is some-

what different from that of, say, the US. In Japan, only NTT maintains the nationwide telecommunications network, and there has been no full competition. We have competitors in the long-distance market, in the local loop, and in mobile telephony, but no one is trying to compete against NTT in all these markets. Real competition would be better not only for the competitor but for us as well. And, of course, it would be in the interest of the end users and the market as a whole. A few large companies of similar size and services might be the best solution. As for breaking up NTT, one of the reasons we get so many inquiries about alliances with foreign companies is that we have an excellent record in R&D. If you break up NTT simply because of its dominant size, its R&D capabil-

ity will be diminished. There are two kinds of R&D, one that requires a shorter turnover of the product to market with relatively low cost, and one that requires long-term commitment and ample resources. This type of R&D needs to take place within a large organization capable of providing the necessary financial and other support.

NTT may need to undergo further restructuring, but does "weakening the giant produce strong industry"? Will the future bring weaker providers of services? Or are smaller providers better equipped to serve the market?

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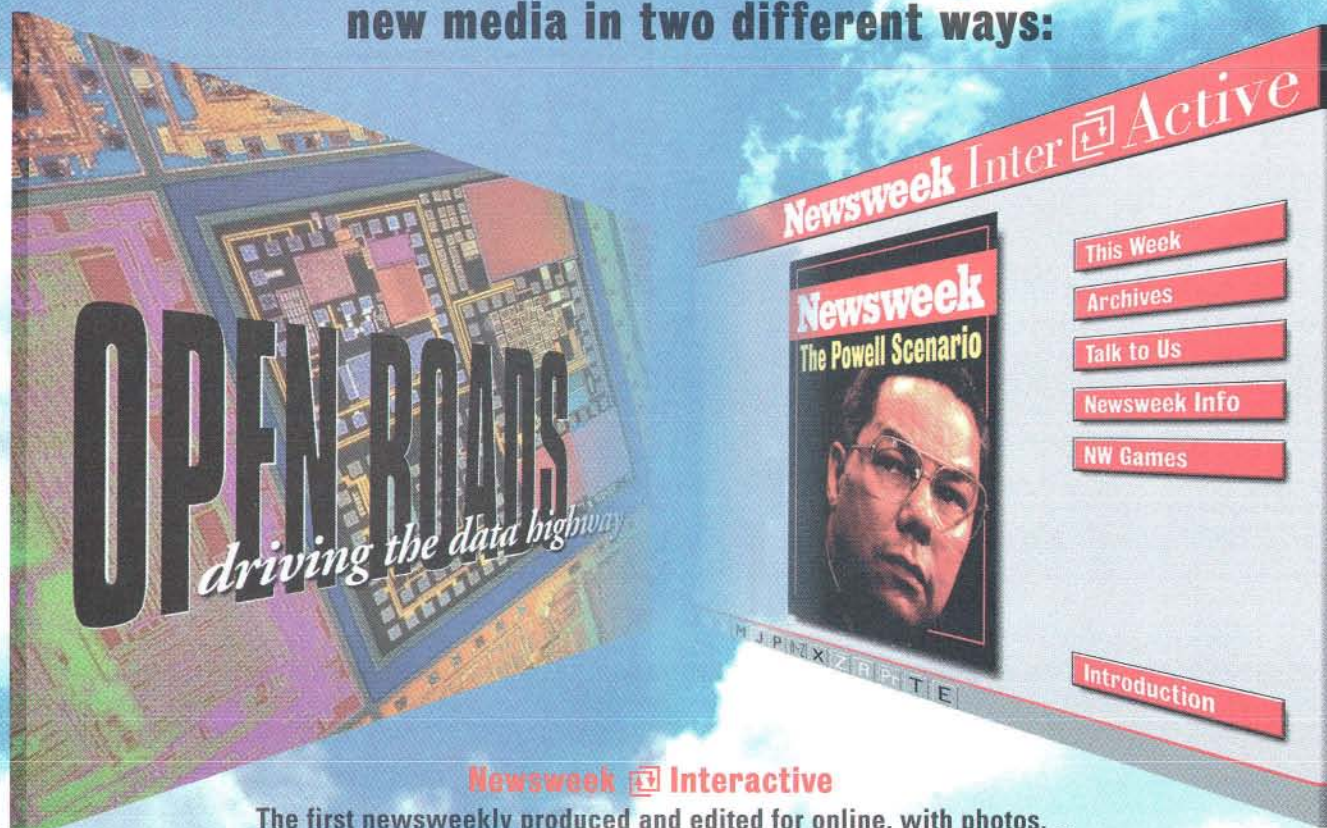
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simply because of its dominant size, its R&D

capability will be diminished.

competitors are big or small is a result, not a prerequisite.

But most large corporations tend to be more bureaucratic and slow – small entrepreneurs are much more agile and aggressive.

There are two kinds of "bigness:" large organizations with a single function, and large organizations with an aggregate of many different functions. NTT is the latter. We can spin out some of the businesses into subsidiaries and group companies. We can be large but efficient at the same time. We have been engaged in the telecommunications business for a long time; we know its positive and negative sides. We often

encounter the argument for breaking up NTT, but seldom do we see the clear reasons why we need to do it.

**What are NTT's current strategic targets?
What is your next source of income?**

No one knows the new sources of added value in the multimedia era. A good case in point may be the new personal handy-phone system (a Japanese version of the digital personal mobile telephone). If it becomes very popular – which may happen fairly soon, depending on who you believe – it might absorb our conventional telephone service.

Our mission now is to determine how to carry as much traffic as possible on our own network. In order to achieve this, we must

make our networks easier for the customers to use and easy to customize. That is our survival strategy for now.

Mainstream research at NTT has focused on technology for switching or transmission, but new fields such as intelligent terminals, software, and human interface design are receiving a lot of attention. NTT alone cannot tap these new frontiers. We need to make more strategic alliances with foreign vendors, to be bold and open-minded. That kind of thinking is already emerging within our research laboratories.

This is a cultural revolution for NTT. Just two or so years ago, making a cooperative research agreement with an American company was never considered. Now it's nothing special. ■ ■ ■



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E-Money

◀ 179 force for me," he says. "My interest in computer security and encryption came from my fascination with security technologies in general – things like locks and burglar alarms and safes," he says. (As a graduate student, he devised two new designs for locks and came close to selling both to major manufacturers.) And, of course, he was very much fascinated with computers. In high school and college, he did typical hacker sorts of things: password cracking, dumpster diving, and such. But he was also picking up some serious background in mathematics. And late in his college career, he came to cryptography, a discovery that in retrospect seems inevitable.

Chaum's first major papers, published in 1979 when he was a graduate student at the University of California at Berkeley, are indicative of his strong focus in his work: devising cryptographic means of assuring

ments in applying technology are rendering hollow both the remaining safeguards on privacy and the right to access and correct personal data. If these developments continue, their enormous surveillance potential will leave individuals' lives vulnerable to an unprecedented concentration of scrutiny and authority."

In the early 1980s, Chaum conducted a quest for the seemingly impossible answer to a problem that many people didn't consider problematic in the first place: how can the domain of electronic life be extended without further compromising our privacy? Or – more daring – can we do this and increase privacy?

In the process, he figured out how cryptography could produce an electronic version of the dollar bill.

In order to appreciate this, you have to consider the apparent obstacles to such a task. The most immediate concern of anyone attempting to produce a digital form of currency is copying. As anyone who has copied a

If anonymity becomes a standard in cyberspace cash systems, we have to accept its potential abuse – as in copyright violations, fraud, and money laundering.

privacy. His ideas build upon the concept of public-key cryptography, the technique devised by Whitfield Diffie and Martin Hellman in the mid-'70s that established cryptography as a mass technology. Specifically what excited Chaum was the use of digital signatures – a way of establishing the authenticity of a message sender. "I got interested in those particular techniques because I wanted to make [anonymous] voting protocols," he says. "Then I realized that you could use them more generally as sort of untraceable communication protocols." The trail led to anonymous, untraceable digital cash.

Dining with the Cryptographer

For Chaum, the politics and the technology reinforce each other. He believes that as far as privacy is concerned, society stands at a crossroads. Proceeding in our current direction, we will arrive at a place where Orwell's worst prophecies are fulfilled. He delineated the problem in an essay called "Numbers Can Be a Better Form of Cash Than Paper." "We are fast approaching a moment of crucial and perhaps irreversible decision, not merely between two kinds of technological systems, but between two kinds of society," says the article, published in 1991. "Current develop-

program from a disk to a hard drive knows, it is totally trivial to produce an exact duplicate of anything in the digital medium. What's to stop me from taking my one Digi-Buck and making a million, or a billion, copies? If I can do this, my laptop, and every other computer, becomes a mint, and infinite hyperinflation makes this form of currency worthless.

The answer to the problem of digital duplication lies in using digital signatures to verify the authenticity of bills. Only one serial number would be assigned to a given "bill" – the number itself would be the bill – and when the unique number was presented to a merchant or a bank, it could be scanned to see if the virtual bill was authentic and had not been previously spent. This would be fairly easy to do if every electronic unit of currency was traced through the system at every point – but that would bring about exactly the kind of surveillance nightmare that gives Chaum the chills. How could you do this and unconditionally protect one's anonymity?

Chaum began his solution by coming up with something called a "blind signature," a process by which a bank, or any other authorizing agency, can authenticate a number so that it can act as a unit of currency – yet the bank itself does not know who has the bill, and therefore cannot trace it. This way, when

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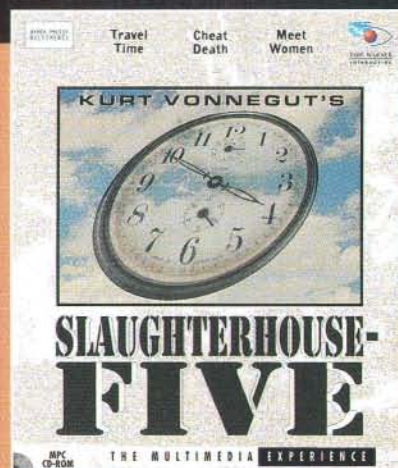
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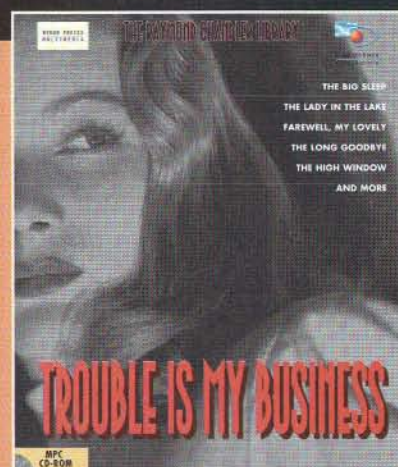
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One of Chaum's most dramatic breakthroughs occurred when he managed to come up with a proof – though for a different application – that this sort of anonymity could be provided unconditionally, with all the assurance of mathematical proof that no one could violate it. The idea came when he was driving his Volkswagen van from Berkeley to his home in Santa Barbara, where he taught computer science at the University of California in the early '80s. "I was just turning this idea over and over in my head, and I went through all kinds of solutions. I kept riding through it, and finally by the time I got there I knew exactly how to do it in an elegant way."

He presented his theory with a vivid example: a scenario of three cryptographers await-

**"There are no walls in cyberspace," says Chaum.
"It's a different, scary,
weird place, and with identification
it's a panopticon nightmare.
It's antithetical to democracy."**

ing the check after finishing their meal at a restaurant. The waiter appears. Your dinner, he tells the cryptographers, has been prepaid. The question is, by whom? Has one of the diners decided to anonymously treat his colleagues – or has the National Security Agency paid for the meal? The dilemma was whether this information could be gleaned without compromising the anonymity of the cryptographer who might have paid for the dinner.

The answer was fairly simple. It involved coin tosses hidden from certain parties. For example, A and B could flip a quarter behind a menu so C couldn't see it – and then each write down the result and pass it to him. The key stipulation would be that if one of them was the culprit who paid for the meal, that person would write down the opposite result of the coin toss. Thus if C received contradictory reports of the coin toss – one heads, one tails – he would know that one of his fellow diners paid for the meal. But without further collusion, he would have no way of knowing which one. By a collection of coin tosses and combined messages, any number of diners could play this game. The idea could scale to a currency system.

"It was really important, because it meant that untraceability could be unconditional," he says. Meaning mathematically bulletproof.

"It doesn't matter how much computer power the NSA has to break codes – they can't figure it out, and you can prove that."

Chaum's subsequent work, as well as the patents he successfully applied for, continued to build upon those ideas, addressing problems like preventing double-spending while preserving anonymity. In a particularly clever mathematical twist, he came up with a scheme whereby one's anonymity would always be preserved, with a single exception: when someone attempted to double-spend a unit that he or she had already spent somewhere else. At that point the second bit of information would allow a trace to be revealed. In other words, only cheaters would be identified – indeed, they would be providing evidence to law enforcement of their attempt to commit fraud.

This was exciting work, but Chaum received little encouragement for pursuing it. "For many years, it was very difficult for me to have to work on this sort of subject within

the field, because people were not at all receptive to it," Chaum says. For several years in the early 1980s, Chaum attempted to personally contact the leading lights in privacy policy and share his ideas with them.

"The uniform reaction was negative," he says. "And I couldn't understand this. It made it all the harder for me to keep pushing on this, because my academic advisors were saying, 'Oh, that's political, that's social – you're out of line! Even the department head at Berkeley said, 'Don't work on this, because you can never tell the effects of a new idea on society.' I acknowledged him in my dissertation, saying it was the rethinking and finally the rejection of this principle that caused me to do this work."

Eventually, Chaum decided that the best way to spread the ideas would be to start his own company. By then he was living in Amsterdam. On a visit with his Dutch girlfriend, he had fortuitously met up with some academics at CWI, Centrum voor Wiskunde en Informatica, the nationally funded Dutch Center for Mathematics and Computer Science in Amsterdam, where he subsequently formed the cryptography research group. So, in 1990, he launched DigiCash b.v., a subsidiary of the US company DigiCash Inc., with his own capital and a contract from the

Dutch government to build and test technology to support anonymous toll payments on highways. Chaum developed a prototype by which smart cards holding a certain amount of verified cash value could be slipped into a gadget affixed to the windshield, and high-speed scanning devices would subtract the tolls as the cars whizzed by. The cards could also be used to pay for public transportation and eventually other items. Of course, the payments would be anonymous. After completing that contract (the system has not yet been implemented), Chaum kept his company active in smart-card applications; some of the projects focused on cash systems that would be used in a building or complex of buildings. The DigiCash headquarters, along with several businesses and agencies around the Netherlands, use the system currently. But to date, the company's operations have been relatively small-scale, even as the world has now come around to seeing the significance of the ideas Chaum hatched in isolation. DigiCash remains independent, without a close alliance with a large partner in banking or financial services. Chaum feels that in time such partners, at least licensees of DigiCash technology, will emerge; if so, his paradigm will be a crucial factor in maintaining privacy in the age of e-money. This is an idea Chaum believes is worth holding out for.

Some people interpret this as stubbornness, or at the least poor business practice. "People wanted to buy David's patents but he asked for too much – he wanted control," says a former DigiCash employee. "The real problem is that privacy isn't what the banks want, it isn't what the stores want. They want something easy to use, fast, and very cheap." (Still, this source guesses that Chaum "has hung on for so long that he will probably succeed.")

Frustrated by not being able to use Chaum's patents, some companies have devised their own schemes for anonymity, which may or may not infringe on Chaum's. More recently, Stefan Brands, formerly at CWI, has come up with an alternative scheme that has drawn considerable interest. Brands contends the system absolutely does not infringe Chaum's patents; Chaum's carefully worded response is, "He's not convinced me that it doesn't."

The topic of patents is touchy; Chaum bristles at any talk that equates him with the robber-baron set. In his mind, the revenues are secondary to the potential effect on society. "It's my mission to do this, because I had this vision that stuff like this might be possible, and felt it was my responsibility to do it. No one was working on this for the good half-dozen years I was; they all thought I was

nuts. They gave me a hard time. We couldn't license, really, without the patents; the whole purpose of them is to get this stuff out there."

Hidden Values

Does anonymity really matter when it comes to electronic money? Some people dismiss its significance – or argue that anonymity is a bad thing.

"Speaking for myself, it would be dangerous and unsound public policy to allow fully untraceable, unlimited value digital currency to be produced," says Kawika Daguio of the American Bankers Association. "It opens up opportunities for abuse that aren't available to criminals now. In the physical world, money is bulky. In the physical world, it is possible to follow people, so a kidnapper can potentially be caught if the currency is marked, if the money was being observed on location, or if the serial numbers were recorded. Fully anonymous cash might allow opportunities for counterfeiting and fraud."

Nathan Myhrvold of Microsoft concurs. "There's a role for untraceable transactions. But it's not a panacea. Some people get very worked up about it. But there's been a very steady trend away from untraceable cash. There are cases where explicit traceability is a good thing. Like in my business expenses. I want them to trace it! All these things are there for a reason. They're not there as part of a plan by nefarious Big Brother. Look, I understand Chaum's concern to a certain degree. There's a lot of concern for privacy today. But I do worry about the idea of saving people from themselves. Just because I sign up for a traceable form of money doesn't mean I want my next-door neighbor to see my transactions."

Chaum says he has never argued for total untraceability, but sort of a constrained anonymity. "My work has been trying to establish a whole space of possibilities, bounded by pure perfect anonymity on one side and a perfect identification on the other side."

Chaum is not the only person working this turf: building on his ideas, researchers at Sandia Labs have been working on a scheme that attempts to balance anonymity with law enforcement's need to trace criminal transactions. Sort of an anonymous, digital-cash Clipper Chip. "I was concerned about some of the effects electronic cash could have on criminal activity," says Ernie Brickell, a Sandia cryptographer. "It could make it very easy for people to undertake kidnappings and extortion. It might be possible for a person to do a kidnapping and ask for money to be exchanged in a way in which there was no

physical exchange – you would have no idea what country the person was in. There was also the potential that new types of criminal activity would emerge. So we looked at whether it would be possible to develop electronic cash schemes in which people could have much of the privacy that Chaum talks about, but with hooks in it, so that if law enforcement had the need to look into a transaction, it could."

Yet it is not at all clear that even this sort of limited anonymity will gain, er, currency. Users of electronic cash – the general public – will probably never be polled on whether they prefer it to be anonymous. Brickell admits that anonymity will be a hard sell. "There's going to be so much information about individuals floating around, that we want to protect privacy as much as we can," he says. "But some of the bankers feel that an anonymous system is never going to make it, or even be something that they can get behind." In fact, says Niels Ferguson, a cryptographer who works for DigiCash, "the people who decide actually often have an interest in not protecting people's privacy because they are among the potential benefactors of gathering the information."

But what of the Nathan Myhrvolds, who seem to argue that they want traceability? Ferguson sighs. "Oh, the number of times I've had to argue with people that they need privacy! They'll say, 'I don't care if you know where I spend my money.' I usually tell them, 'What if I hire a private investigator to follow you around all day? Would you get mad?' And the answer always is, 'Yes, of course I would get mad.' And then my argument is, 'If we have no privacy in our transaction systems, I can see every payment – every cup of coffee you drink, every Mars bar you get, every glass of Coke you drink, every door you open, every telephone call – you make. If I can see those, I don't need a private investigator. I can just sit behind my terminal and follow you around all day.' And then people start to realize that, yes, privacy is in fact something important. Any one part of the information is probably unimportant. But the collection of the information, that is important."

Which is exactly why certain officials are licking their chops at the prospect of traceable cash. These include, of course, law-enforcement agencies, who are more than eager to see hard cash phased out. What would the drug dealers do? The money launderers? The underground economy? They will argue that granting anonymity to digital cash would provide a bonanza for kidnappers, muggers ... criminals of every stripe. But consider a world where all ► 218

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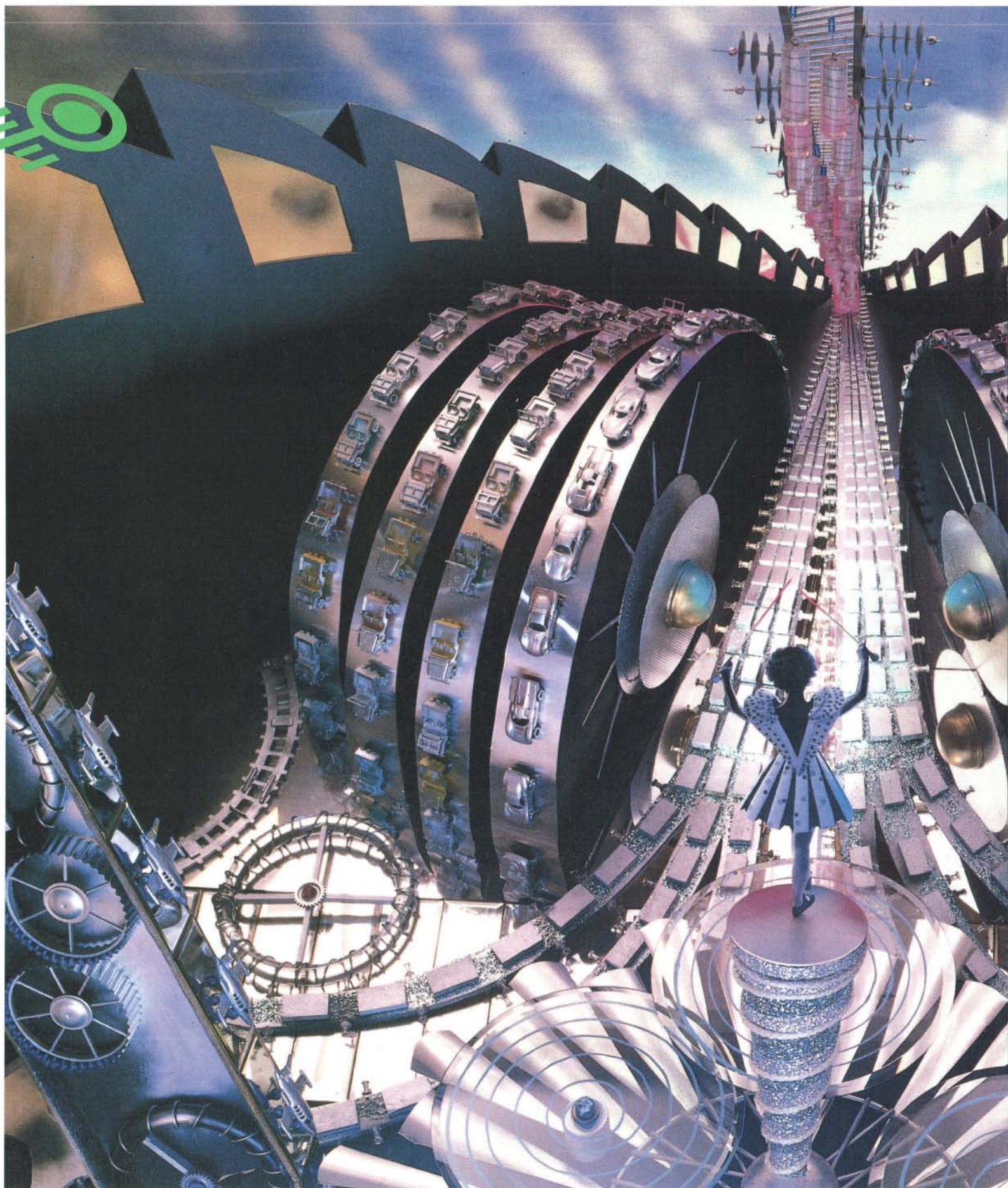
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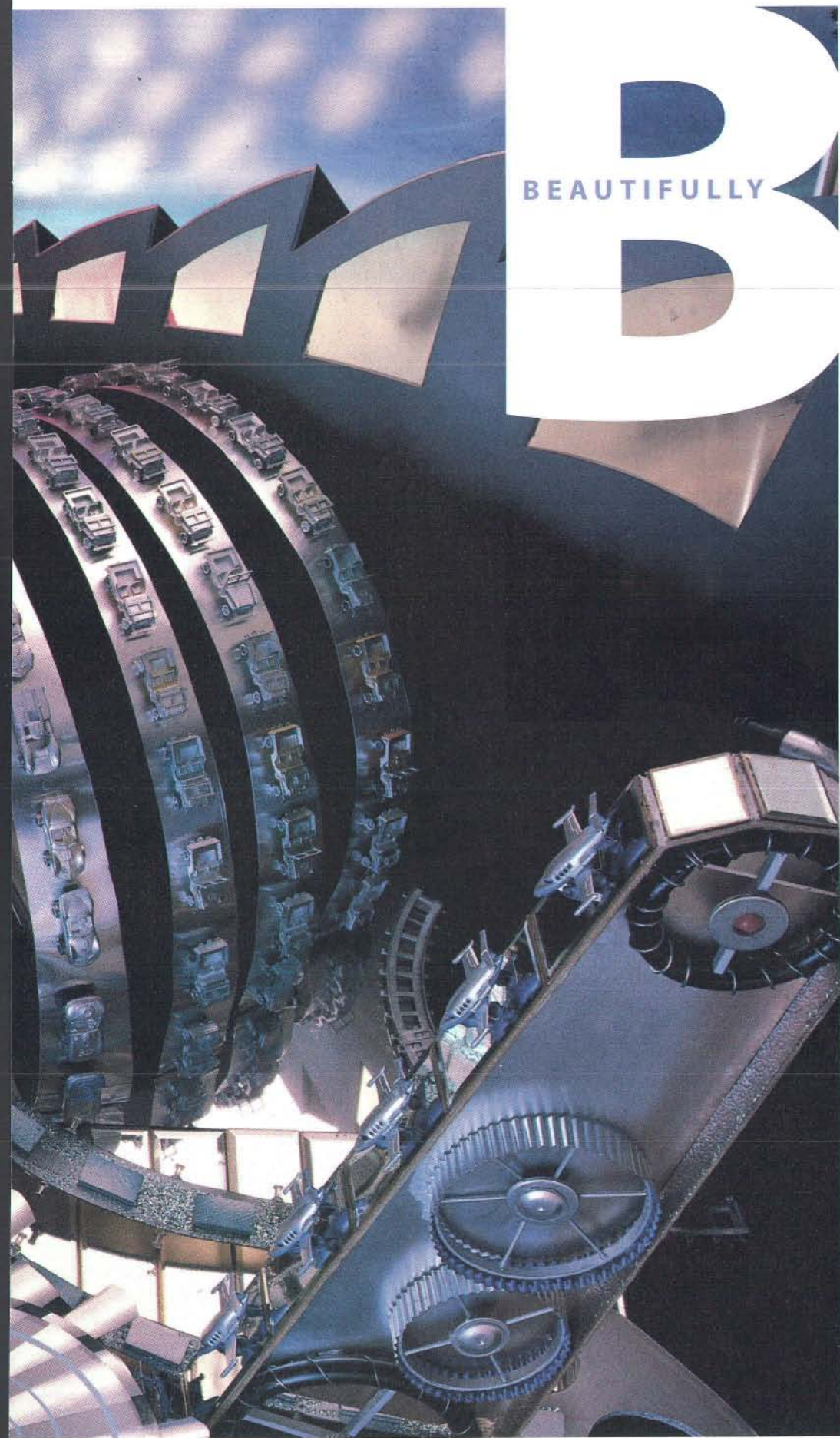
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BEAUTIFULLY

B I Z A R R E

After several years as art director for Bloomingdale's and Macy's, Brian Randall quit, sickened by the materialism and greed of the New York fashion industry. His frustrations fuel *The B Book*, a postmodern fairy tale set in capitalist America that tells the story of the spoiled young Miss Bee and her Donald Trumpish rise to power and fortune.

Although the good-versus-evil theme makes for a classic fairy tale, the slick and often jarring images reflect a different tradition: that of advertising. The project began as an installation for storefront windows along Wall Street. To seduce the passersby and "suck them in," Randall turned to the imagery of advertising, "the language of the people."

His pop-art style is part *Wizard of Oz*, part opera set, part drag-queen ball. All of the 46 color plates are created in a pre-computer cut-and-paste style and combine photographs, illustrations, and life-size and miniature sets – constructed of Q-tips, cellophane, costume jewelry, and plastic trinkets.

To create the Factory image (at right), *The B Book* team constructed an 8-by-12-foot set using wheels, thumb tacks, silver spray-painted Matchbox cars, silver glitter, and a cutout photograph of Miss Bee. The result is a metallic fantasy of production and power, a *Nutcracker*-like dream of industry controlled by a glittery techno-princess.

The happy simplicity of the early pictures gives way to darker, more twisted and layered images as Miss Bee is consumed by power and greed. Sometimes playful, sometimes disturbing, these images pack a punch. This is pop art motivated by political angst and social idealism. – *Jessie Scanlon*

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The institution with the most to gain is the Internal Revenue Service. The computer age has been very good to the IRS, which now has access to any number of databases that yield reality checks on any given citizen's tax returns. Traceable cash would accelerate this process, and the tax-collection agency can't wait to take advantage of it. In a recent speech – presented on April 15, no less! – Coleta Brueck, the project manager for the IRS's Document Processing System, described some of the IRS's plans. These include the so-called "Golden Eagle" return, in which the government automatically gathers all relevant aspects of a person's finances, sorts them into appropriate categories and then tallies the tax due. "One-stop service," as Brueck puts it. This information would be fed to other government agencies, as well as states and municipalities, which would draw upon it for their own purposes. She vows "absolutely" that this will happen, assuming that Americans will be grateful to be relieved of the burden of filing any taxes. The government will simply take its due.

"If I know what you've made during the year, if I know what your withholding is, if I know what your spending pattern is, I should be able to generate for you a tax return," she says. "I am an excellent advocate of return-free filing. We know everything about you that we need to know. Your employer tells us everything about you that we need to know. Your activity records on your credit cards tell us everything about you that we need to know. Through interface with Social Security, with the DMV, with your banking institutions, we really have a lot of information, so why ... at the end of the year or on April 15, do we ask the Post Office to encumber itself with massive numbers of people out there, with picking up pieces of paper that you are required to file? ... I don't know why. We could literally file a return for you. This is the future we'd like to go to."

It isn't the future that David Chaum would like to go to, though, and in hopes of prevent-

ing that degree of openness in an individual's affairs, he continues doggedly in his crusade for privacy.

Megabucks on the Net

Cyberspace is destined to be the first battleground of the digital money wars. While it will take years, perhaps decades, for e-money to replace hard currency in the physical world, the virtual world not only can't accommodate the current system, but is desperate for immediate implementation of the digital equivalent. Everyone agrees that the Internet is the staging ground for the first true boom in electronic commerce, but it's a transactional wasteland. You can't buy anything without a credit card. You can't even collect on a \$2 bet with a friend.

It is here that the difference between electronic money and electronic cash will become most apparent. The network equivalent of some of the current forms of electronic commerce – traceable credit cards and debit cards – are already well under way. One of the prime movers in this initiative is the CommerceNet consortium, which intends to deliver an infrastructure for, among other transactions, encrypted credit-card payments through the Net. These will work exactly like regular credit-card transactions, except that the actual account numbers will be scrambled so

eavesdroppers, known as packet sniffers, can't intercept them and make illegal charges. Sort of the electronic equivalent of crumpling up the carbons.

Of course, these transactions are officially traceable – "When you buy something, the seller is identified to the buyer," says Cathy Medich, executive director of CommerceNet.

While this is undoubtedly useful, the open structure of the Net begs for a more cash-like system. Why should only those businesses pre-approved as official merchants be able to sell things? Why can't people transfer money to one another? "If I owe you \$25 and say, 'I'm good for it, I have a credit card in my wallet,' what can you do?" asks Bruce Wilson, chief operating officer of CyberCash. "You can't do anything. You're not a merchant. That's the situation in the online world, with virtual storefronts and countless potential entrepreneurs who can't process credit cards. There

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are millions of college students who want space on a server to sell things. Poets who want to sell a limerick of the day. Weather servers with satellite images. They need a cash-like methodology. For those people, anonymity is not an issue. It's simply the problem of doing peer-to-peer payments. You to me, you to a relative. That's why we have a requirement for cash. So if *Wired* magazine has an archive of articles on a server, and a researcher is sitting somewhere at 2 a.m. searching the Net, he can say, 'Oh, here's five articles by this expert Steven Levy.' And he can download those articles. For a dollar, a dollar-fifty, two-fifty an article. He's happy to have it!"

CyberCash, of course, is planning to offer a system that will do network cash, but is reserving judgment on the degree of anonymity it will use. "If the marketplace is looking for anonymity, our service will not be used if it is not offering it to a sufficient degree," says Bruce Wilson. "If it never becomes an issue, it will not need to be there. For our cash services, we plan a middle-of-the-road approach."

Meanwhile, there is "e-cash," offered by David Chaum's DigiCash. Anonymity is at the center of e-cash, which works with Windows, Mac, and Unix clients. I played with a beta version in Amsterdam and found it easy to use – as simple as reaching in a pocket and buying something but leaving no digital trace. This ease is indicative of all e-money schemes, really: mundane on the surface but either repressive or subversive underneath. A simple example: if Chaum's scheme could be used for downloading the thousands of documents available on the World Wide Web, then anyone could start a cottage business by selling files for low prices – say 10 cents, 25 cents apiece. (Chaum says that the cost for a transaction would eventually be infinitesimal, maybe one-tenth of a cent.) Eventually, as bandwidth increases, information in all sorts of formats – like audio and video – could be offered for cash. And no trail would follow the buyers – the sellers could not automatically stick your buying preferences on a mailing list. The government could never track your reading preferences. Or, to be honest, your lack of tax payments. Whereas in the alternative, everything might be traced.

E-cash rolled out on an experimental basis early this fall (<http://www.digicash.com/>). Each user, upon enrollment, gets \$100 in token CyberBucks. This can be e-mailed to friends and acquaintances or spent in coins, simply by tapping a mouse.

How anticlimactic – clicking on "OK" to fork over funds! But unseen to the user, something miraculous is going on. Computer cycles are furiously crunching cryptography that

represents the very best of David Chaum's dream. Secure money, accurately accounted for, unconditionally untraceable. It is a proof of concept that the future need not be one where purchases are tied to spenders.

At press time, DigiCash counted 15 businesses and organizations around the globe, including Encyclopaedia Britannica, getting ready to set up "shops" that will sell info for e-cash. Presumably, these new virtual storefronts will raise the sophistication level of the system from its initial state, which is, considering that e-cash is the vanguard of a new financial system, rather casual. Of the first few places to spend CyberBucks, one was the DigiCash store (where you could buy a reprint of a Chaum article, "Achieving Electronic Privacy," *Scientific American*, 1992, for \$2.84 in digital cash). Another was something called Big Mac's Monty Python Archive Shop, offering homegrown transcriptions of Monty Python movies and routines for various increments of CyberBucks. A disclaimer cheerfully admitted a direct approach to the copyright question: it read, "I basically just stole these texts."

In a sense, that sophomoric admission gets to the heart of e-money. If anonymity becomes a standard in cyberspace cash systems, we have to accept its potential abuse – as in copyright violations, fraud, and money laundering. Innovative new crypto schemes have the potential for mitigating these abuses, but the fact of anonymity guarantees that some skullduggery will be easier to pull off. On the other hand, the lack of anonymity means that every move you make, and every file you take, will be traceable. That opens the door to surveillance like we've never seen.

"You have to let your readers know how important this is," Chaum tells me when discussing online anonymous cash. "The choice can only be made once." He thinks that if an economic system that tracks all transactions comes to cyberspace, the result would be much worse than the situation in the physical world. "Cyberspace doesn't have all the physical constraints," he says. "There are no walls ... it's a different, scary, weird place, and with identification it's a panopticon nightmare. Right? Everything you do could be known to anyone else, could be recorded forever. It's antithetical to the basic principle underlying the mechanisms of democracy."

David Chaum believes, as he wrote in an article in 1992, that "in one direction lies unprecedented scrutiny and control of people's lives; in the other, secure parity between individuals and organizations. The shape of society in the next century may depend on which approach predominates." ■ ■ ■

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Winter

◀ 171 the alternative life of the Internet, bulletin boards on CompuServe, and computer conventions. He addresses crowds at computer shows and carries on monster e-mail correspondences. He's probably the first major intellectual to have given up traditional print publishing for digital; his CD-ROMs aren't hobbies, they're his major works.

Winter's live presentations consist of nothing but a guy, his piano, and his mind, but your brain cells light up as bright as they do at any rock concert. He was once coaxed into giving a night school course by UCLA's extension program. The first week he had 20 students; within a couple of years, the course was attracting hundreds. Eventually these talks were taped and broadcast nationally by American Public Radio. Winter doesn't bring an outline or note card with him; his preparation consists of a look at the syllabus to see what needs covering. Then he wings it.

In his classroom at UCLA, he's a flamboyant, ebullient figure in a burgundy silk shirt – "To the hard rock world I'm probably a meek little professorial type; to the musicology world, I'm Mick Jagger," he says. He paces as he talks, lunging to the piano to illustrate points, or to the Macintosh to play portions of his CD-ROMs. (When he heads to campus he carries bulging canvas sacks containing, among other things, a portable CD-ROM drive and a PowerBook.) He's charismatic but accessible, making connections not just intellectual but personal. Trying to convey the political content of Beethoven's Napoleon-besotted *Eroica* symphony in a class, he realizes he has to make an even more basic point: music can be political. He asks one student whether she thinks Nirvana has any political import. She nods shyly but hopefully. Score! During breaks, the kids mill about, looking dizzied but happy.

A hookup to some invisible energy grid seems to pump an extra megawatt or two into Winter. "He's always addressing an audience," laughs one LA music scene old-timer. Winter explains, "I'm a borderline manic-depressive." But he seems to live almost entirely on the up side of the hyphen and to have no trouble focusing the energy. He roars through breakneck 18- and 19-hour days, pausing occasionally for brief naps that "take all the garbage out."

His wife, Julia, recalls a party when a stranger asked her if she had "any stuff." It took her a second to realize he was asking her for drugs. "You know," the guy urged, "whatever it is your husband's on." ■ ■ ■

Colophon

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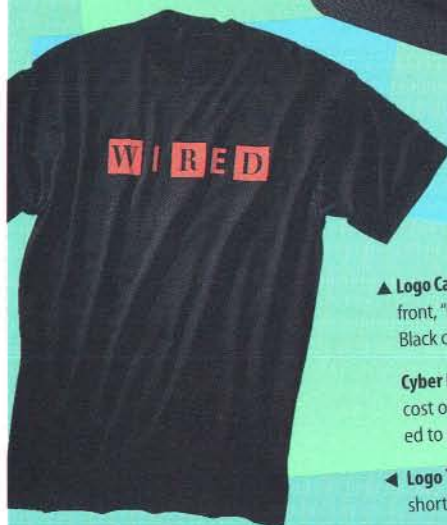
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From: Nicholas Negroponte
<nicholas@media.mit.edu>
To: Louis Rossetto <lr@wired.com>
Subject:

Digital Expression

Computing as Photography

Jerome Wiesner, former president of MIT and co-founder of the Media Lab, tells a story about Vladimir Sworkin, who visited him one Saturday at the White House when Wiesner was John Kennedy's science advisor. He asked Sworkin if he had met the president. As Sworkin had not, Wiesner took him across the hall and introduced him as "the man who got you elected." Startled, the President asked, "How is that?" Wiesner explained: "This is the man who invented television." Kennedy replied, "How terrific. What an important thing to have done," to which Sworkin wryly commented: "Have you seen television recently?"

Technological imperatives, and only those imperatives, drove the development of TV. Then it was handed off to a body of creative talent with different values and from a different intellectual

plementary perspectives, each as powerful as the others. Music can be considered from the digital signal processing point of view, including such difficult problems as sound separation (like taking the noise of a fallen Coke can out of a music recording). Or it can be considered from the perspective of musical cognition: how do we interpret the language of music, what constitutes appreciation, and where does emotion come from? Finally, music can be treated as artistic expression, with a story to be told and feelings to be aroused. The point is that all three are important in their own right and allow the domain – music – to be the perfect intellectual landscape for moving gracefully between science and art.

The traditional kinship between mathematics and music is multiplied manyfold within the hacker community, which tends to be musically inclined, if

Strasbourg goose, leaving the right sides to catch as catch can – or shrivel into a pea.

Seymour Papert tells the story of a mid-19th-century surgeon magically transported through time into a modern operating theater. This doctor would not recognize a thing, would not know what to do or how to help. Modern technology has transformed the practice of surgical medicine. By contrast, if a mid-19th-century school teacher were carried by the same time machine into a present-day classroom, that teacher could be a substitute teacher today, more or less picking up where his or her late-20th-century peer left off. There is no fundamental difference between the way we teach today and the way we did 150 years ago. The technology is almost the same.

This sort of change is slow. I believe that's because it's deep – deeper than most people think. We are moving away from a hard-line mode of teaching that caters primarily to compulsive, serialist children, toward one that is more porous and draws no lines between art and science or right brain and left brain. When children use the Logo program language to make pictures on their computer screens, those images are at once artistic expression and mathematical expression, seen as both or either.

What was once only an abstract concept – like math – now has a window into it that has many components from the visual arts. What this means by extension is that computers will make our future adult population much more visually literate and artistically able than today. Ten years from now, teenagers are likely to enjoy a much richer panorama of options because the pursuit of intellectual achievement will not be tilted in favor of bookworms but cater to a range of expressive tastes.

"The Return of the Sunday Painter," the title of a chapter I contributed to *The Computer Age: A Twenty-Year View* more than two decades ago, is meant to suggest a new era of respect for avocations and a future with more active engagement in making, doing, and expressing.

My belief in this comes from watching computer hackers, both young and old. Their programs are like paintings: they have aesthetic qualities and are shown and discussed in terms of their meaning from many perspectives. Their programs include behavior and style that reflect their makers. These people are the forerunners of the new expressionists.

Next issue: Bits and Atoms

Computers will make our future adult population much more visually literate and artistically able. Intellectual achievement will not be tilted toward bookworms but cater to a range of expressive tastes.



subculture. Photography, on the other hand, was invented by photographers. The people who perfected photographic techniques did so for their own expressive purposes, fine-tuning the technology to meet the needs of their art. Means and messages were deeply intertwined.

Personal computers have moved computer science away from the purely technical imperative and are evolving more like photography. Computing is being channeled directly into the hands of very creative individuals at all levels of society and is becoming the means for creative expression in both its use and development. The means and messages of multimedia will become a blend of technical and artistic achievement.

Music as Fly Paper

Music is one example. During the Media Lab's early days, MIT colleagues advised me to avoid computer music. They said: "Nicholas, MIT thinks multimedia is sissy science; including music will just put the nail in the coffin." To me their remarks were a code: do it. Ten years later, music has proven to be one of the most important shaping forces for the Media Lab.

Music can be viewed from three diverse but com-

not gifted. Even if music is not a student's professional objective, it satisfies an often important need for avocation.

This can be generalized because many avocations are needlessly subordinated by parental and social forces, when they could be vehicles for more meaningful, deeper learning. The concept of a hobby is subject to great change in digital life. While it is used to mean an extracurricular passion, in the digital world such hobbies can be part of the toys with which we think and the tools with which we play.

The computer provides a complete range of points of entry to music and does not limit access to the prodigious child, nor to those who are sufficiently disciplined or genetically inclined.

The Return of the Sunday Painter

Painting is another example. A refrigerator door with a child's drawing attached to it is as wholesome as apple pie. We encourage our children to be expressive and to make things. But when they reach age 6 or 7, we switch gears on them. We leave them with the impression that art class is at best like baseball (a hobby) and at worst for wimps. And for the next 20 years we feed their left brains like a

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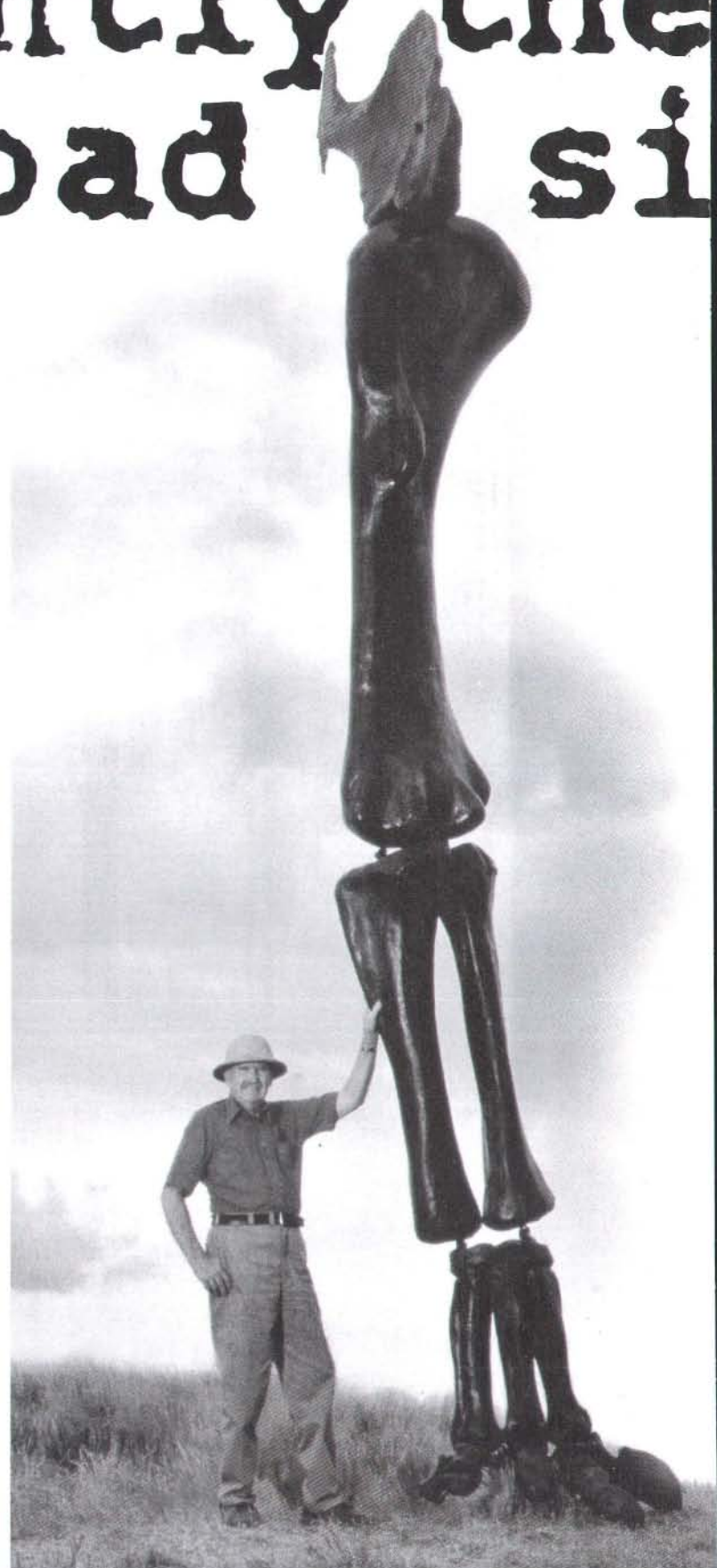
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Apparently the not a bad si

9. Thoughts on international business.

For many years growth was one of the business community's main driving forces. The occasional question marks were trivialized with terms such as "economy of scale" and "critical mass". Once you were big enough, you were considered unassailable.

We have since found out that it was precisely the size of seemingly invulnerable mammoth organizations which turned out to be a handicap in many cases. These giants found themselves beset by so many new, smaller, flexible and highly motivated companies nipping at their ankles that they started to totter. Which explains the efforts currently under way within many an organization to find ways of restoring a degree of flexibility to what is now realized to be an unwieldy structure. That is why Origin considers itself fortunate never



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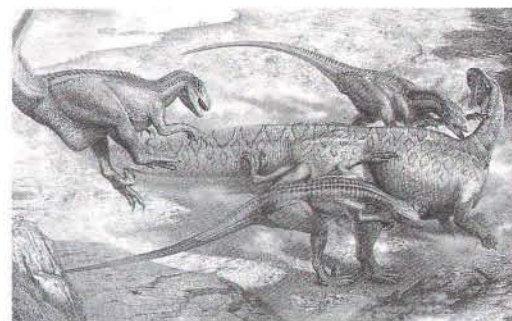
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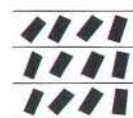
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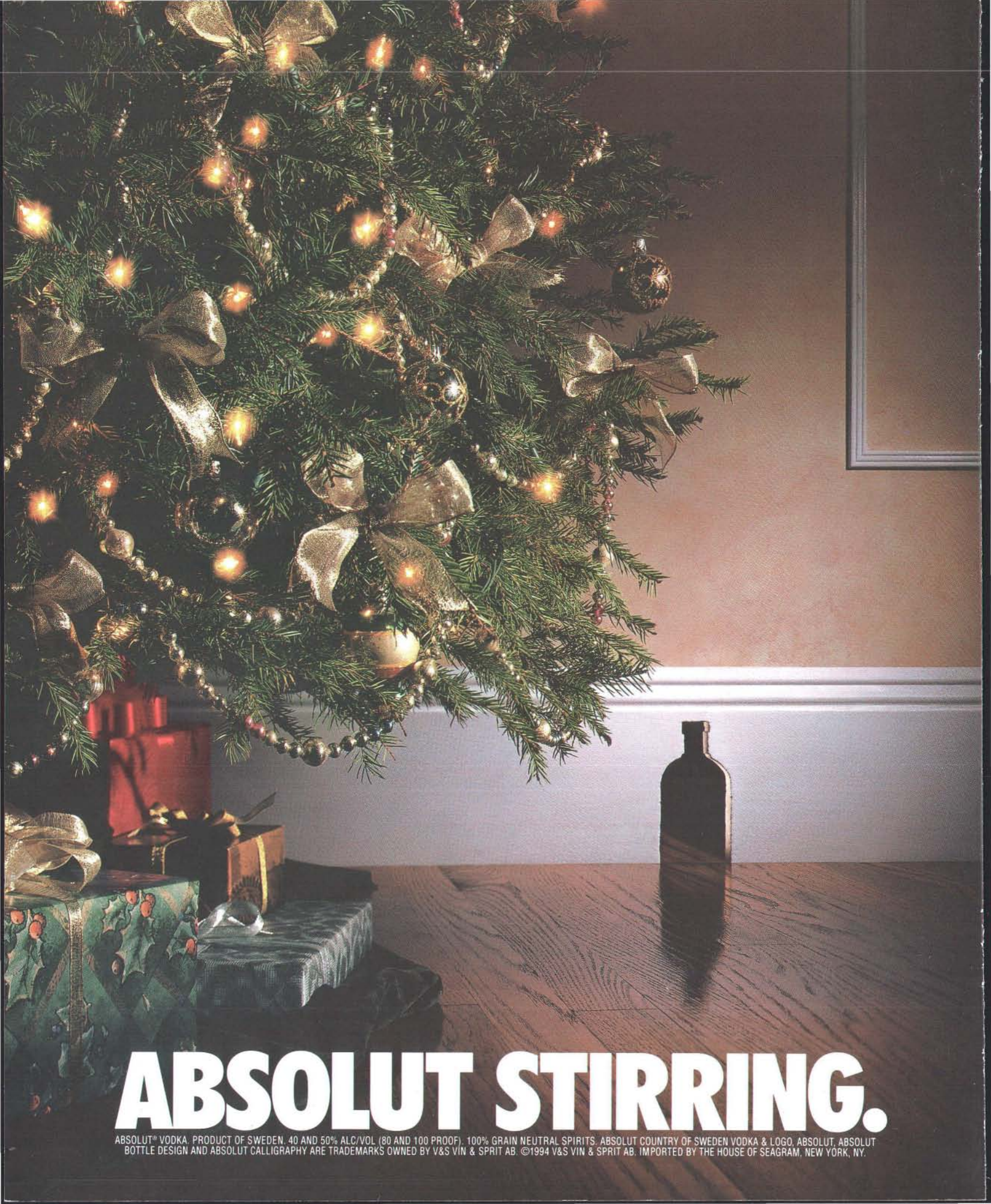
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